**A PROPOSED MEDIATION MODEL OF THE EFFECTS OF MOTIVATION FOR A HEALTHY LIFESTYLE: IMPACTS ON EMOTIONAL EXHAUSTION, MEDICATION REGIMENS, AND LOW-DENSITY LIPOPROTEIN**

THESIS

Nathan M. Leuthold, Captain, USAF

AFIT/GEM/ENV/12-M12

**DEPARTMENT OF THE AIR FORCE**
**AIR UNIVERSITY**

***AIR FORCE INSTITUTE OF TECHNOLOGY***

**Wright-Patterson Air Force Base, Ohio**

AFIT/GEM/ENV/12-M12

# A PROPOSED MEDIATION MODEL OF THE EFFECTS OF MOTIVATION FOR A HEALTHY LIFESTYLE: IMPACTS ON EMOTIONAL EXHAUSTION, MEDICATION REGIMENS, AND LOW-DENSITY LIPOPROTEIN

THESIS

Presented to the Faculty

Department of Systems and Engineering Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Engineering Management

Nathan M. Leuthold, BS

Captain, USAF

March 2012

AFIT/GEM/ENV/12-M12

A PROPOSED MEDIATION MODEL OF THE EFFECTS OF MOTIVATION FOR A HEALTHY LIFESTYLE: IMPACTS ON EMOTIONAL EXHAUSTION, MEDICATION REGIMENS, AND LOW-DENSITY LIPOPROTEIN

Nathan M. Leuthold, BS
Captain, USAF

Approved:

| | |
|---|---|
| /signed/ | 24 Feb 12 |
| John J. Elshaw, Lt Col, USAF (Chairman) | Date |
| /signed/ | 24 Feb 12 |
| R. David Fass, Lt Col, USAF (Member) | Date |
| /signed/ | 24 Feb 2012 |
| Alfred E. Thal, Jr., PhD (Member) | Date |

## Abstract

This research addressed the question of, "How are behavioral indicators related to physiological responses?" There were three theories (Conservation of Resources; Planned Behavior; and Achievement Motivation) employed to build a proposed model of the effects that an individual's motivation for a healthy lifestyle will have on their emotional exhaustion, daily medication usage, and low-density lipoprotein. Motivation for a healthy lifestyle was hypothesized to have a negative relationship with emotional exhaustion, while utilizing body mass index as a partial mediator. Emotional exhaustion was hypothesized to have positive relationships with daily medication usage and low-density lipoprotein. The model was tested using linear regression modeling and an archival dataset that contained a behavioral survey, anthropometric measurements, and blood samples. All the relationships except those between motivation for a healthy lifestyle and emotional exhaustion, and the partial mediation were supported. An alternate explanation for the lack of support for two of the hypotheses is included. This research is unique, in that it incorporates behavioral constructs and physical outcomes, a combination that has been identified as underutilized in the realms of organizational and behavioral research.

## Acknowledgments

Foremost, I am greatly indebted to my advisor, Lt Col John Elshaw for his guidance and willingness to see me through to the end.  I also greatly appreciate the expertise and assistance provided by my committee: Lt Col Fass and Dr. Thal.  I would also like to thank Dr. Schlub and Dr. Moore at the WPAFB Health and Wellness Center for their assistance with technical matters pertaining to the dataset; I would have been lost in the data without them.  Lastly, I would like to express my tremendous gratefulness to my wonderful wife and children for their unending support!

Nathan M. Leuthold

# Table of Contents

Page

## List of Figures

## List of Tables

Page

## List of Equations

A PROPOSED MEDIATION MODEL OF THE EFFECTS OF MOTIVATION FOR A HEALTHY LIFESTYLE: IMPACTS ON EMOTIONAL EXHAUSTION, MEDICATION REGIMENS, AND LOW-DENSITY LIPOPROTEIN

## I. Introduction

Organizational leaders and managers benefit from the good health of their employees (Aldana & Pronk, 2001; Schultz & Edington, 2007). Beyond reductions in sickness, benefits such as reduced anxiety and absenteeism have been linked to employee health (Focht & Koltyn, 1999; Kobasa et al., 1982; Kobasa, Maddi, & Puccetti, 1982; Long & van Stavel, 1995). Therefore, behaviors associated with good health could be advocated by leaders and managers to help organizations reap the benefits associated with better employee health (Goetzel et al., 2002; Mills, Kessler, Cooper, & Sullivan, 2007). Examples of such behaviors are healthy eating (Elmer et al., 2006), exercise (Long & van Stavel, 1995), smoking cessation (Lisspers et al., 1999), even responsible management of personal finances (James & Brown, 1997). Physiological indices have been shown to be predictive of future health issues such as hypertension, diabetes, and cardiovascular disease (Calle, Thun, Petrelli, Rodrequez, & Heath, 1999; Janssen, Katzmarzyk, & Ross, 2002). Physiological indices have also been used as measures of psychological constructs with negative effects on physical health, such as stress (Juster, McEwen, & Lupien, 2010; Porges, 1995; Segerstrom & Miller, 2004) and anxiety (Toker, Shirom, Shapira, Berliner, & Melamed, 2005).

## Background

Psychological researchers have been interested in the body's physiological responses to psychological constructs for many years (Ilies, Dimotakis, & De Pater, 2010), but the employment of physiological measures are far less prevalent in the behavioral research realm. Heaphy and Dutton (2008) observed that behavioral researchers could greatly benefit from using physiological indices, but that the current use is sparse. This research integrates behavioral, psychological, and physiological constructs that can contribute to filling this gap in the existing literature. By integrating these constructs, behavioral researchers can begin to examine the impact on an individual's physiology when they are experiencing various behavioral and psychological phenomena. Additionally, the integration of constructs can provide researchers with insight into how individual and organizational relationships can affect an individual's physiology, and how organizations can better allocate resources to mitigate potential negative effects of those relationships (Heaphy & Dutton, 2008).

## Research Question & Theoretical Model

In an effort to fill the gap identified by Heaphy and Dutton (2008), the following research question is addressed:

*How are behavioral indicators related to physiological responses?*

The research question is accompanied by a theoretical model (Figure 1) depicting a proposed relationship between behavioral constructs and physical outcomes.

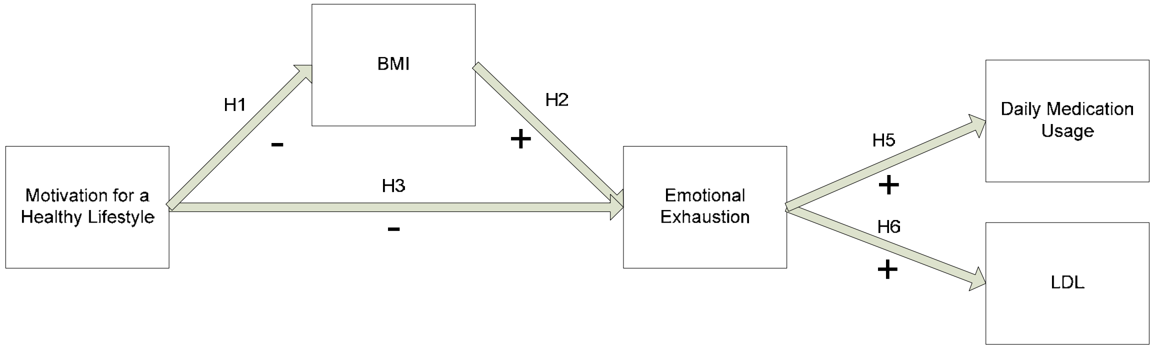


**Figure 1: Proposed Mediation Model**

The model suggests an individual's motivation for a healthy lifestyle, along with a mediator variable, body mass index (BMI), predicts the level of emotional exhaustion that an individual will experience in their work environment. The level of emotional exhaustion will then be predictive of their daily medication usage and low-density lipoprotein (LDL) levels in their blood. The model is underpinned by three theories: Theory of the Conservation of Resources (Hobfoll, 1989), Theory of Planned Behavior (Ajzen, 1991), and Achievement Motivation Theory (Atkinson & Feather, 1966). The Theory of the Conservation of Resources is employed to explain the relationships in hypotheses 2 through 6; additional resources gained through a healthy lifestyle will be utilized in the work environment, therefore affecting emotional exhaustion and the physical outcomes of daily medication usage and low-density lipoprotein. The relationship in hypothesis 1 is explained by the theories of Planned Behavior and Achievement Motivation; an individual will engage in those activities that they deem as necessary to achieving a healthy lifestyle, and that these activities will impact their body mass index.

**Preview of Chapters**

The remainder of this paper will consist of three chapters. Chapter II will define each of the constructs and address the derivation of each hypothesis in turn, while reviewing the relevant literature associated and the theoretical underpinnings. Chapter III (Methodology & Results) will address the particulars of the archival dataset that was used to test the theoretical model, as well as the data analysis strategy, and results of the analysis. Chapter IV will discuss the research findings, its limitations, implications, and recommendations for future research.

## II. Background of the Hypotheses of the Theoretical Model

### Definition of Constructs

The following paragraphs define the behavioral constructs and physical outcomes that are being integrated in the proposed theoretical model. The constructs of the model will be addressed in the order of hypothesis, as indicated in Figure 1. The first behavioral construct to be defined is motivation. Motivation is defined as "a disposition to strive for a certain kind of satisfaction, as a capacity for satisfaction in the attainment of a certain class of incentives (Atkinson & Feather, 1966). Its definition has been expanded by other theorists to include "nondirective, but energizing drive" (Brown, 1961). Motivation is a proposed predecessor to the first physical outcome, body mass index (BMI). Body mass index is an anthropometric measure calculated by dividing one's body weight in kilograms by the square of their height in meters (BMI = weight / height$^2$ ) (Frankel & Staeheli, 1992). A recommended BMI value is between 18.5 and 24.9; those under 18.5 are considered underweight, those between 25.0 and 29.9 are considered overweight and those greater than 30.0 are considered obese (National Institutes of Health, 2010; National Institutes of Health, ). Body mass index has been shown to be predictive of health risks associated with obesity (Calle et al., 1999); however, some argue that waist circumference is a better predictor of obesity- related health risks (Janssen, Katzmarzyk, & Ross, 2004).

The second behavioral construct in the model is emotional exhaustion, which has its roots in human stress. Human stress research started during the mid 1930s when Walter Cannon suggested that stress was what he termed a "stimuli," which was anything that threatened the internal environment of the subject, such as oxygen deprivation or cold temperatures (Elliot & Eisdorfer, 1982).  In the 1950s, Hans Selye generated the theory that stress was the body's physiological response to an external stimulus that threatened the body's processes (Harries, 1997).  The next 30 years of stress research saw the introduction of additional theories, such as those regarding stress as a specific response to a specific stimulus (Elliot & Eisdorfer, 1982), stimulus-based theories merged with characteristics of the individual which Hobfoll termed, "Event-Perception Viewpoints," and models put forth by McGrath and Trumbull based on imbalances between demands required of stressors, and the response capacity of the individual (Hobfoll, 1989).  Stressors can either present the individual with an opportunity for personal development and growth or seen as obstacles to personal development and growth; these two types of stressors are referred to as challenge stressors and hindrance stressors, respectively (Podsakoff, Lepine, & LePine, 2007).  Hindrance stressors usually originate externally to the individual.  In the case of work related hindrance stressors, they can come from areas such as increased bureaucracy, role ambiguity, or inter-personal conflicts (Rodell & Judge, 2009).  Therefore, stress is to be defined as a state the body assumes when external pressures are applied, which cause a shift in the body's physical, chemical, or emotional equilibrium (Elliot & Eisdorfer, 1982; Hobfoll, 1989).

Exposure to prolonged or chronic stress is why an individual experiences emotional exhaustion.  A body under chronic stress will be less likely to adapt to environmental changes since the chronic stress depletes the physical and psychological resources beyond the level required for adaptation (Epel, McEwen, & Ickovics, 1998). Resources are defined as "those entities that are centrally valued in their own right or act as a means to obtain centrally valued ends" (Hobfoll, 2002). Depletion of physiological and psychological resources also allows chronic stress to hinder various aspects of daily life, such as decision-making (McEwen, 2004), immunity (Herbert & Cohen, 1993), psychological thriving (Epel et al., 1998), weight management (Dallman et al., 2003), and motivation (Maslach, 2003). Additionally, research has demonstrated that individuals under prolonged exposure to chronic stress are likely to suffer burnout (Bakker, Schaufeli, Leiter, & Taris, 2008). Burnout is defined as exhaustion of physical and/or emotional strength or motivation, commonly characterized by emotional exhaustion and cynicism (Gonzalez-Roma, Schaufeli, Bakker, & Lloret, 2006; Hakanen, Bakker, & Schaufeli, 2006; Schabracq, Winnubst, & Cooper, 2003). Reduced personal efficacy and physical exhaustion have been postulated as additional characteristics of burnout, but some researchers disagree (Brand et al., 2010; Cordes & Dougherty, 1993; Gonzalez-Roma et al., 2006). The second behavioral construct of the theoretical model is emotional exhaustion. Emotional exhaustion is defined as the draining of emotional resources as a result of overtaxing work resulting in feelings of chronic fatigue (Gonzalez-Roma et al., 2006; Hakanen et al., 2006; Langelaan, Bakker, van Doornen, & Schaufeli, 2006).

In order to explain why the relationships in the model may exist, it is important to define two more behavioral constructs: vigor and work engagement. These two constructs play an important part in how the behavioral constructs of the model relate to the physical outcomes. Vigor is conceptualized as the theoretical opposite of emotional exhaustion (Bakker et al., 2008; Gonzalez-Roma et al., 2006). Vigor is defined as possessing high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence in the face of difficulties (Bakker et al., 2008; Gonzalez-Roma et al., 2006; Hakanen et al., 2006). Others argue that vigor is a separate construct that can be experienced simultaneously with emotional exhaustion (Shraga & Shirom, 2009). In this context, vigor is conceptualized as being divisible into three categories: physical strength, such as that exerted during athletic activities; emotional energy, such as feelings of pleasantness and contentment; and cognitive liveliness, such as the feeling of being mentally awake (Shraga & Shirom, 2009). In the context of being an opposite of emotional exhaustion, vigor is considered to be one of the three core characteristics of work engagement. Work engagement is defined as positive feelings of fulfillment and motivation regarding one's work, characterized by vigor, absorption, and dedication (Bakker, Demerouti, & Schaufeli, 2005; Kuhnel, Sonnentag, & Westman, 2009; Sonnentag, 2003). Work engagement differs from motivation in that motivation is a means, while work engagement is an end-state of mind (Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). Motivation for one's work, or that "disposition to strive…" (Salanova, Agut, & Peiro, 2005) or "energizing drive" (Atkinson & Feather, 1966), is a predecessor to an individual being able to experience work engagement. Motivation has been conceptualized as a process, in which physical and psychological inputs contribute to a worker's ability to experience work engagement (Brown, 1961).

The two physical outcomes on the right-hand side of the model are daily medication usage and low-density lipoprotein (LDL). Daily medication usage is simply an individual's daily regime of prescription or non-prescription pharmacological medications. Low-density lipoprotein is defined as a molecule found in the blood that is composed of a lipid and a protein, the purpose of which is to transport fuel to bodily tissues (Fulton, 1950; Worsiewicz, 1991).

**Derivation of Hypotheses**

The proposed theoretical model (Figure 1) rests on the Conservation of Resources (COR) theory introduced by Hobfoll (1989):

> This resource-oriented model is based on the supposition that people strive to retain, protect, and build resources and that what is threatening to them is the potential or actual loss of these valued resources. (p. 1)

The COR theory divides resources into four categories: objects, conditions, personal characteristics, and energies. When any of these are reduced, humans attempt to replenish or replace them (Hobfoll, 1989). Energy resources are further broken down into physical, emotional, and cognitive domains (Hobfoll, 2002). Hobfoll's theory has been employed numerous times in recent years (Kuhnel et al., 2009; Llorens, Schaufeli, Bakker, & Salanova, 2007; Mauno, Kinnunen, & Ruokolainen, 2007; Shraga & Shirom, 2009; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). As an example of its recent application, Kuhnel et al. (2009) used COR theory as the framework for their study on the effects of two to three day work respites on employee recovery and work engagement. They hypothesized and found that since physical, emotional, and psychological resources are necessary for work engagement (Kahn, 1990), the resource recovery provided by two to three day work respites would increase work engagement (Kuhnel et al., 2009). In the same way, physical and psychological resources necessary for work engagement may be able to be replenished or replaced through motivation for a healthy lifestyle. Individuals could utilize the physical and psychological strength and endurance gained through a healthy lifestyle to either undergo the task of replenishing the lost resources or to serve as replacements for the lost resources.

The Theory of Planned Behavior states, “Intentions are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior” (Ajzen, 1991). Individuals will engage in the behaviors necessary to achieve success in the activities in which they desire to succeed. The greater their intention to succeed, the more effort they will exert toward those behaviors that they have determined are necessary for success; this is their strength of motivation. According to the Theory of Achievement Motivation, “

> The strength of the motivation to perform some act is assumed to be a multiplicative function of the strength of the motive (achievement in this case, which is the disposition to approach success), the expectancy that the act will have as a consequence the attainment of an incentive, and the value of the incentive. (Atkinson & Feather, 1966)

The success of motivation in fostering the adoption and continuance of healthy lifestyle behaviors is well documented in existing literature (Dzewaltowski, 1989; Kilpatrick, Hebert, & Bartholomew, 2005; Miller, Koceja, & Hamilton, 1997; Pinto et al., 2002; Standage, Sebire, & Loney, 2008; Teixeira et al., 2006). A potential indicator of a healthy lifestyle is Body Mass Index (BMI). Lowering body mass index over time is linked to a healthy lifestyle through losses in body fat, as a result of increased calorie utilization and decreased caloric intake; therefore, if an individual is determined to succeed at implementing healthy lifestyle behaviors, then their BMI will decrease (National Institutes of Health, 2010). Therefore, the following relationship is posited:

*Hypothesis 1: Motivation for a healthy lifestyle has a negative relationship with BMI.*

In line with the COR theory of reasoning, the physical and psychological resources gained through a healthy lifestyle could benefit individuals in terms of reducing their experiences of burnout and its core characteristic of emotional exhaustion. The existing literature indicates that the employment of physical exercise for the purposes of influencing burnout and work engagement can range from highly individualized, user specific plans (Mills et al., 2007), to web-based initiatives for wide implementation across an organization (Cook, Billings, Hersch, Back, & Hendrickson, 2007), to group efforts designed to increase cohesion and engagement while reducing conflict (Stockton, Rohde, & Haughey, 1992). Existing studies report significant relationships between exercise programs and illness, anxiety, and absenteeism (Focht & Koltyn, 1999; Kobasa et al., 1982; Kobasa et al., 1982; Long & van Stavel, 1995), but not unanimously (Hughes, Casal, & Leon, 1986). Additionally, some researchers have suggested that low to moderate intensity was superior to high intensity (Steptoe & Cox, 1988), but not exclusively (Altchiler & Motta, 1994). Salmon (2001) published a meta-analytical review of existing literature regarding exercise and stress. The studies he compiled tend to address aerobic exercise, as opposed to anaerobic exercise, and measures of the cardiovascular system (Salmon, 2001). Salmon (2001) delineates between laboratory and real-life stressors, as well as experimental and cross-sectional studies, for which he defines cross-sectional studies as those that select participants based on current fitness and past exercise participation, as opposed to experimental studies in which exercise participation is controlled. The laboratory stressors predominately fell in the realm of acute stress introduced through various tasks or interpersonal interactions, while the real-life stressors would tend to be more representative of chronic stress. Real-life stress was found to be reduced in individuals who reported higher levels of physical activity (Salmon, 2001). These studies are of particular interest, because the real-life stress situations defined by Salmon (2001) include the day-to-day aspects that could contribute to chronic stress and burnout. Healthy eating has also been shown to correlate with decreased burnout (Eastman, 1996; Fall, Wolf, Schiller, & Wilson, 2003).

Decreases in BMI could lead to increased physical resources, because of lower body fat content and greater overall health. These physical resources can then be carried over and expended in the work environment. The expenditure of carried-over physical resources in the work environment could lead to less emotional exhaustion. Therefore, the following relationship is posited:

*Hypothesis 2: BMI has a positive relationship with emotional exhaustion.*

Just as the COR theory allows for the carryover of resources from non-work to work activities, the Theory of Achievement Motivation states that an individual's motivation for achievement does not need to be specific to a certain activity but can be a general motivation to succeed (Atkinson & Feather, 1966). While existing studies support how and why one's motivation for a healthy lifestyle influences one's engagement in activities concomitant with a healthy lifestyle, such as exercising and healthy eating (Dansinger, Tatsioni, Wong, Chung, & Balk, 2007; Plonczynski, 2000), and how motivation for work effects job performance (Latham & Pinder, 2005; Lu, 1999), there is a gap in the existing literature regarding how motivation for a healthy lifestyle impacts one's work related emotional exhaustion. The following relationship was posited to address this gap:

*Hypothesis 3: Motivation for a healthy lifestyle has a negative relationship with emotional exhaustion.*

Along with the relationships posited in Hypotheses 1-3, a mediation relationship is also depicted in the theoretical model (Figure 1). Mediators are said to "explain how external physical events take on internal psychological significance" and "speak to the how and why such effects occur" (Baron & Kenny, 1986). Mediation can be either complete or partial. Partial mediation is present in a model when the product of the effects of the independent variable and the mediator (the indirect effect) is smaller than, and of the same sign as, the total effect of the independent variable on the dependent variable when the mediator is excluded (Shrout & Bolger, 2002). When the indirect effect and the total effect are equal, complete mediation is said to exist (Shrout & Bolger, 2002). The mediation of the relationship between the independent variable and emotional exhaustion may be due to the increased vigor experienced by the individual that they carry over from the non-work to the work environment. Current literature supports the notion that vigor can carry over from non-work to work environments (Shraga & Shirom, 2009). Studies have also shown positive relationships between exercise and vigor (Hughes et al., 1986; Steptoe & Cox, 1988; Wilfey & Kunce, 1986). Successes in BMI reduction due to a healthy lifestyle could serve as a psychological replacement for expended resources. Along with the carry-over of vigor supported by the COR theory, this notion is also supported by the Theory of Counter-conditioning. The Theory of Counter-conditioning posits that the repeated exposure to a controlled stressor would hasten one's adaptation to stress (Weiss, Glazer, Pohorecky, Brick, & Miller, 1975). The physical act of exercise, and the self discipline required for healthy eating, may fill the role of a controlled stressor. Salmon (2001) agrees that "The particular value of exercise might therefore be that it is a controllable stressor." A decrease in BMI may be viewed by the individual as success due to a behavior they determined as necessary for success, thereby resulting in increased emotional energy, a category of vigor, which can be carried over for expenditure in the work environment. This would explain the "psychological significance" of the "external physical event" of decreased BMI. The following relationship is, thus, posited:

> *Hypothesis 4: BMI will partially mediate the relationship between motivation for a healthy lifestyle, and emotional exhaustion.*

Individuals lacking sufficient physical and psychological resources may be more prone to take short-cuts, such as daily medication usage, to compensate for those resources. Sonnenshchein et al. (2007) observed that test subjects experiencing burnout had a greater affinity for sleep medication usage than those not experiencing burnout. Similarly, Ahola et al. (2007) showed that individuals suffering from burnout had higher rates of antidepressant usage, even when controlling for depression and anxiety disorders, than those not suffering from burnout. However, other studies have shown no correlation between burnout and affinity for medication use (Lindeberg et al., 2008). The issues that are commonly treated by regular medication usage, such back pain, chronic fatigue, trouble sleeping, type 2 diabetes, and high cholesterol, could be treated through long-term lifestyle changes, such as increased exercise and healthier eating to promote weight loss or overall increased health (Kaplan, Hartwell, Wilson, & Wallace, 1987; Sonnenschein, Sorbi, van Doornen, Schaufeli, & Maas, 2007; Tekur, Singphow, Romarao Nagendra, & Raghuram, 2008; Ueno et al., 1997; Wood et al., 1988). In line with the COR theory though, individuals experiencing emotional exhaustion will not possess the excess personal resources necessary to make the long-term lifestyle changes. Medication provides a quicker solution, requiring less expense of personal resources; therefore, the following relationship is posited:

*Hypothesis 5: Emotional exhaustion will have a positive relationship with daily medication use.*

Along with depleting physical and psychological resources needed for long-term lifestyle changes, emotional exhaustion has also been shown to have physiological effects on the human body (Melamed, Kushnir, & Shirom, 1992; Melamed et al., 1999). Existing literature contains numerous studies demonstrating the physiological effects of stress, which is a known predecessor of emotional exhaustion (Gonzalez-Roma et al., 2006; Langelaan et al., 2006). Table 1 provides a sampling of some of those studies. A quick inspection of the table shows that, by and large, acute stress is the most commonly measured psychological construct and that cardiovascular (blood pressure and heart rate), hypothalamic-pituitary-adrenal (HPA) axis, and immune system responses are the most often employed items of physiological measure. Further examination of the table shows that immune system factors such as lymphocytes (McEwen, 1998), white blood cell count (Herbert & Cohen, 1993), and salivary immunoglobulin A (Zeier, Brauchli, & Joller-Jemelka, 1996), along with many others (Segerstrom & Miller, 2004), have been correlated with chronic stress and burnout. Factors associated with cardiovascular disease, such as glucose, total cholesterol, low-density lipoprotein, triglycerides, and uric acid (Laaksonen et al., 2005; Melamed et al., 1992; Shirom, Westman, Shamai, & Carel, 1997), have also shown to be sensitive to chronic stress. As with acute stress, burnout has been correlated with salivary cortisol (Galantino, Baime, Maquire, Szapary, & Farrar, 2005; Melamed et al., 1999), cholesterol, glucose, triglycerides, uric acid (Melamed et al., 1992; Shirom et al., 1997), and immune system factors (Segerstrom & Miller, 2004).

**Table 1: Sampling of Existing Research on Stress Employing Physiological Measures**

| Citation | # of Studies | Physiological Measures Employed |
|---|---|---|
| (Heaphy & Dutton, 2008) | 9 | Blood pressure, heart rate |
| (Heaphy & Dutton, 2008) | 4 | Salivary cortisol, urinary cortisol, plasma oxytocin |
| (Heaphy & Dutton, 2008) | 2 | Immunoglobulin G, natural killer cell activity |
| (Evans, Lercher, Meis, Ising, & Kofler, 2001) | 1 | Blood pressure, heart rate, urinary cortisol |
| (Ilies et al., 2010) | 1 | Blood pressure |
| (Galantino et al., 2005) | 1 | Salivary cortisol |
| (Zeier et al., 1996) | 1 | Salivary cortisol, immunoglobulin A |
| (James & Brown, 1997) | 1 | Urinary catecholamines |
| (Laaksonen et al., 2005) | 1 | Plasma glucose |
| (McEwen, 1998) | 1 | Lymphocytes |
| (Melamed et al., 1999) | 1 | Salivary cortisol |
| (Melamed et al., 1999) | 1 | Total cholesterol, low density lipoprotein, glucose, triglycerides, uric acid |
| (Melamed et al., 1999) | 1 | Total cholesterol, triglycerides |
| (Epel et al., 1998) | 1 | Cortisol |
| (Herbert & Cohen, 1993) | 36 | Immune cell function, circulating white blood cells, immunoglobulin, herpesvirus antibody titers |
| (Bellingrath, Weigl, & Kudielka, 2009) | 1 | Cortisol, epinephrine, norepinephrine, dehydroepiandrosterone-sulphate (DHEAs), waist/hip ratio, hemoglobin (HGB) A1C, high-density lipoprotein, total cholesterol, blood pressure, tumor necrosis factor-α (TNF-α), C-reactive protein, fibrinogen, D-dimer, percent body fat, triglycerides, glucose |
| (Linden, Lenz, & Con, 2001) | 1 | Blood pressure, total cholesterol, triglycerides, high-density lipoprotein |
| (Grossi, Perski, Evengard, Blomkvist, & Orth-Gomer, 2003) | 1 | DHEAs, progesterone, estradiol, cortisol prolactin, transforming growth factor beta (TGF-β), TNF-α, neopterin, C-reactive protein, HGB A1C |
| (Dickerson & Kemeny, 2004) | 208 | Cortisol |
| (Arnetz, 1984) | 1 | HGB A1C, plasma glucose |
| (Segerstrom & Miller, 2004) | 300 | Immune system parameters |
| (van Eck, Berkhof, Nicolson, & Sulon, 1996) | 1 | Salivary cortisol |

Low-density lipoprotein (LDL) is a molecule made up of a lipid and a protein; its purpose is to transport triglycerides and free fatty acids to the bodily tissues to be used as fuel (Fulton, 1950; Worsiewicz, 1991). Low-density lipoprotein is a derivative of very low-density lipoprotein which has had some of its triglycerides hydrolyzed for use by the bodily tissues. As the triglycerides are removed, the lipoprotein is left with higher concentrations of cholesterol and phospholipids; this results in a low-density lipoprotein (Worsiewicz, 1991). Low-density lipoprotein is a known factor in the development of arteriosclerosis (hardening of the arteries) and cardiovascular disease (Juster et al., 2010; Melamed et al., 1992). Cardiovascular disease has been shown to have a positive association with allostatic load, which is the wear and tear that the body experiences as a result of over-activation of the sympathetic nervous system (SNS) (Juster et al., 2010). The SNS is responsible for what are often referred to as the "fight-or-flight" responses. The engagement of the SNS can cause glycogen stores in the liver to be converted back into glucose and reabsorbed into the blood, thereby increasing blood glucose levels. The desire of the body to maintain homeostasis causes the beta cells of the islets of Langerhans, contained in the pancreas, to secrete insulin in reaction to an elevated blood glucose level. Prolonged activation of the beta cells of the islets of Langerhans can lead to depleted production of insulin (Worsiewicz, 1991). Reduced presence of insulin in the blood causes the body to convert fat deposits in the adipose tissue into triglycerides and free fatty acids for use by bodily cells, which are transported by lipoproteins in the plasma (Worsiewicz, 1991). This re-absorption of stored fat occurs because the lack of insulin, wherein insulin is required for up-take of glucose by cells, prohibits the body from burning glucose for energy as it normally would; the body thus resorts to burning stored fats (Worsiewicz, 1991).

Another potential explanation for the relationship between emotional exhaustion LDL is that individuals experiencing emotional exhaustion may be prone to consume foods that are higher in saturated fat. Overeating, alcohol abuse, and engagement in other behaviors related to ill-health have been linked to individuals experiencing burnout (Laurie, 2001; Pompili et al., 2006). Consumption of foods high in saturated fat is known to cause increases in LDL (Fulton, 1950). Rather than either the physiological explanation or the consumption explanation being responsible for the emotional exhaustion – LDL relationship on its own, the two explanations may be complementary; therefore, the following relationship is hypothesized:

*Hypothesis 6: Emotional exhaustion will have a positive relationship with LDL.*

## III. Methodology & Results

### Participants

The theoretical model will be tested using an archival dataset. The dataset resulted from a study conducted by the Wright Patterson Air Force Base (WPAFB) Health and Wellness Center (HAWC) titled, “Effect of Dietary, Exercise, Motivational Interventions, and Goal-Setting Strategies on Positive Lifestyle Change and Reducing Health Risk Factors among Civilian Personnel with Various Disease Risk Parameters.” According to the Proposal for Clinical Investigation (Appendix A), the purpose of the study was to “determine if active intervention with education and support in motivation/goal setting strategies for positive lifestyle changes in the areas of fitness and nutrition positively affects risk for disease.” The motivation for the study was to address concerns related to an observed increase in morbidity and mortality rates among WPAFB civilian employees. Participants for the study were solicited from the WPAFB civilian population, with the requirement that each individual be between the ages of 18 and 65 years, and possess at least two of the following criteria:

Blood Pressure > 140/90

Total Cholesterol > 240

Body Mass Index > 30

Fasting Blood Glucose > 140

Waist Circumference:

Men > 40 inches

Women > 35 inches

Active smoker

Aerobic exercise < twice a week

The total number of participants enrolled in the study was 113.

Table 2 shows the data collected at times 1 and 2 of the study (which were 16 weeks apart).

**Table 2: Number of Data Entries per Data Type at Times 1 & 2**

| Data Type | Time 1 | Time 2 |
|---|---|---|
| Completed Survey | 112 | 63 |
| Anthropometric Data Recorded | 113 | 66 |
| Blood Samples Provided | 111* | 57 |
| Daily Medication Usage | 113 | Not Collected |
| Returned Diet & Exercise Logs | N/A | 41 |

*LDL was recorded for 110 participants; one data record was missing VLDL and LDL

A one-way analysis of variance (ANOVA) was conducted for each of the variables affected by participant attrition: motivation, emotional exhaustion, BMI, and LDL. These ANOVAs were conducted to examine if there was a difference between those individuals who dropped out of the study and those who stayed. The results of the ANOVAs showed that no significant differences ($p < .05$) were found between the two groups. Detailed results of the ANOVAs can be found at Appendix B.

## Data Collection

The participant's levels of emotional exhaustion and motivation for participation in a healthy lifestyle program were evaluated by a survey (Appendix C) administered at the beginning (Time 1) and end (Time 2) of the 16-week study period. For the purposes of this thesis, "healthy lifestyle" will be operationalized as "exercise and healthy eating." A seven-point Likert scale ranging from "1 = Strongly Disagree" to "7 = Strongly Agree" was used for the emotional exhaustion and motivation items. There were nine items measuring emotional exhaustion and nine items measuring motivation. Examples of the emotional exhaustion items are: "I feel burned-out from my work" and "I feel used up at the end of the day." No reversed-coded items were used for emotional exhaustion. Examples of the motivational items are: "I want to do well in this program" and "I am extremely motivated to do well in this program." Two reverse-coded motivation items were used (e.g., "I just don't care how I do in this program"). Reliability analysis was conducted for the motivation items at Time 1 ($\alpha = .91$) and Time 2 ($\alpha = .95$), and emotional exhaustion items at Time 1 ($\alpha = .92$) and Time 2 ($\alpha = .92$). Detailed output of the reliability analysis can be found at Appendix D.

A principal component analysis (PCA) was conducted on the eighteen motivation and emotional exhaustion items for Time 1 and Time 2. The PCA utilized varimax rotation, with a fixed number of factors to be extracted (2), and coefficient values below .4 suppressed. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy of the analysis: KMO for Time 1 = .85, with all KMO values for individual items > .7; KMO for Time 2 = .76, with all KMO values for individual items > .64, which is above the acceptable limit of .5(Field, 2009). Bartlett's test of sphericity yielded: Time 1 $X^2$

(153) = 1910.31, $p < .001$; Time 2 $X^2$ (153) = 1134.94, $p < .001$, which indicated that the correlations between items were sufficiently large for PCA. Two components explained 66.65% of the variance for Time 1, and 68.29% of the variance for Time 2; this was depicted by the scree plots at Figure 2 and Figure 3. Detailed output of the PCA can be found at Appendix E.

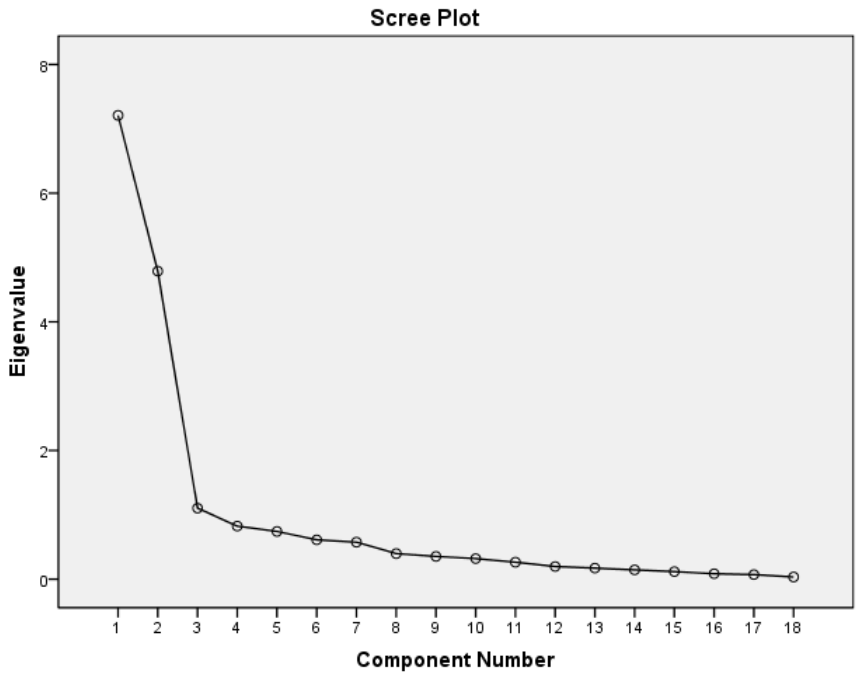


**Figure 2: Scree Plot for Time 1 PCA**

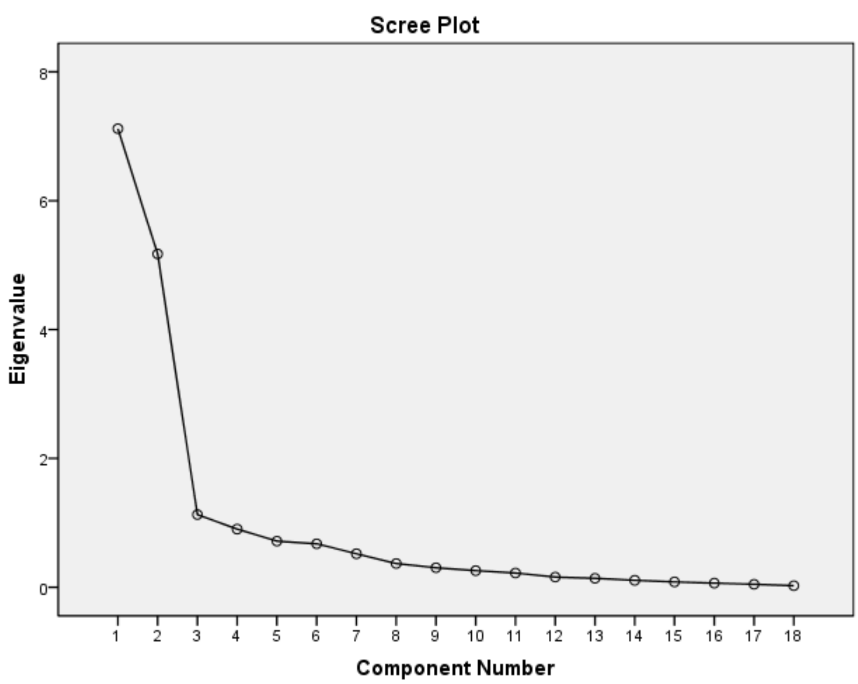


**Figure 3: Scree Plot for Time 2 PCA**

Anthropometric measurements and blood samples were taken at times 1 and 2 of the study. The following anthropometric data were collected: height, waist measurement, inter-iliac crest width, weight, body fat analysis, and body mass index (BMI. Blood samples were collected by venipuncture at the WPAFB medical center. All blood samples were analyzed for the following factors: C-reactive protein, blood glucose, hemoglobin A1C, homocysteine, lipid profile, and complete blood count with differentiation.

Data regarding daily medication usage were collected at Time 1 of the study. The medications were broken into the following categories: asthma, gastro-esophageal reflux, high blood pressure, diabetes, non-steroidal anti-inflammatory, mental health, anti-lipids, hypothyroid, and a miscellaneous category for any other daily medications, such as a daily regimen of aspirin or ibuprofen for back or muscle pain. Daily participation in exercise and healthy eating was logged by the participant for the following categories and submitted at Time 2 of the study: days at/below recommended calories, days consuming > 5 servings fruits/vegetables, days consuming > 5 glasses of water, days consuming > 25mg of fiber, days doing at least 20 minutes of aerobic exercise, days doing strength training, days with total steps taken > 10,000.

**Data Analysis Strategy**

Due to the sample size of the archival dataset, linear regression modeling was employed to test the hypotheses of the theoretical model. The dataset contains 113 records, which is too few for structural equation modeling or path analysis (Field, 2009). Regression modeling does not provide the same level of causal analysis as structural equation modeling or path analysis; however, it does allow for the testing of, and control for, more variables than would a simple t-test conducted for each hypothesis.

To prepare the data for regression analysis, a mean value was calculated for emotional exhaustion and motivation from the Likert values entered in the surveys. Separate means were calculated for times 1 and 2. Deltas between times 1 and 2 were then calculated for each participant's emotional exhaustion and motivation; the deltas were calculated as "Delta = Time 2 – Time 1" in order to depict increases as positive values. For example, if someone had a higher mean emotional exhaustion at Time 2, then their delta of emotional exhaustion would be a positive number; if they had a lower mean emotional exhaustion at Time 2, then their delta of emotional exhaustion would be negative. The deltas were not made absolute values in order to predict that an increase/decrease in one construct would be related to an increase/decrease in another construct.

Along with linear regression modeling, the Baron and Kenny (1986) method for testing for mediation was conducted in order to test Hypothesis 4. Baron and Kenny (1986) indicates that for mediation to be present, the following three conditions must to true: 1) the independent variable must affect the mediator when regressing the mediator on the independent variable, 2) the independent variable must affect the dependent variable when regressing the dependent variable on the independent variable, and 3) the mediator must affect the dependent variable when regressing the dependent variable on the mediator and independent variable, simultaneously. If the effect of the independent variable is greater in condition 2 than condition 3, and in accordance with the hypothesized direction, then mediation is present (Baron & Kenny, 1986).

**Power Analysis**

Statistical power (1 – β), significance criterion (α), sample size (N), and effect size are the four basic parameters of statistical inference, of which three are usually known, or estimated, and used in calculating the fourth (Cohen, 1987). Cohen (1987) argues that a power analysis should be completed to either ascertain the required sample size needed to achieve adequate statistical power to reject a null hypothesis or, in a case such as this thesis, to determine the statistical power provided by an archival data set.

Historically, employment of rules-of-thumb has been popular in calculating a required sample size for regression modeling (Cohen, 1987). While some rules-of-thumb simply call for a baseline number of subjects for regression analysis regardless of the number of predictor variables, others are more complex and are computed based on the number of predictor variables to be incorporated into the regression model (Green, 1991). Rules-of-thumb are attractive due to their ease of use, but Cohen (1987) argues that such an approach ignores the importance of effect size, thereby leading to either premature rejection of the null hypothesis or unnecessary reluctance to reject the null hypothesis. Cohen (1987) is not alone in his preference for power analysis over rules-of-thumb (Field, 2009; Green, 1991). When conducting a power analysis to determine sample size, the estimation of effect size is said to be the most difficult parameter to establish because it must be posited prior to testing, when a researcher may not know how much of an effect a predictor variable, or combination of variables, may have on a dependent variable (Maxwell, 2000). Cohen (1987) posits three ways to estimate effect size: theory, past research, and setting operational definitions. He established operational definitions for regression analysis as .10, .30, and .50 for small, medium, and large effect sizes, respectively; a power of .80 is typically regarded as sufficient for behavioral research (Cohen, 1987). Cohen (1987) asserts that small effect sizes are likely observed in areas such as “personality, social, and clinical-psychological research,” while behavioral science studies often yield medium effect sizes and large effect sizes may be likely in “sociology, economics, and experimental and physiological psychology…or the presence of good experimental control…” While operational definitions of the effect sizes are helpful for narrowing estimation, the true effect size being employed for sample size calculations should be firmly based in the researcher’s knowledge of the subject and theory supporting the hypothesized outcome of the study (Cohen, 1987; Field, 2009; Green, 1991).

When employing an archival dataset, the need is not to determine sample size to achieve sufficient statistical power, but rather to calculate the power provided by the dataset and evaluate whether or not it will be adequate to detect the effects of the predictor variable(s). In order to facilitate conducting the power analysis, Cohen provides tables containing recommended sample sizes broken down by expected effect size and proposed significance criterion (α). As opposed to the earlier stated definitions of small, medium, and large effect size recommended for simple hypothesis testing, an index of $f^2$ values (which Cohen (1987) describes in detail how to compute) is used for entering the tables with values of .02, .15, and .35 for small, medium, and large, respectively (Cohen, 1987).

Table 3 through 6 show the power provided by the dataset for each hypothesis. For evaluation of the power values provided in the tables, a minimum power requirement of .8 is utilized, based on Cohen’s (1987) recommended 4:1 ratio of α to β. A power of .8

represents an 80% chance of detecting an existing effect (Field, 2009). Effect sizes are from Cohen's (1987) operational definitions for behavioral sciences. The non-centrality parameter (L) is calculated in the following way:

$$L = f^2 * v \tag{1}$$

Where:
L = Non-centrality parameter
$f^2$ = Effect size
v = Error value

The error value (v) is calculated in the following way:

$$v = (N - u - 1) \tag{2}$$

Where:
v = Error value
N = Sample size
u = Number of independent variables

**Table 3: Power Analysis for Hypotheses 1, 2, & 3**

| Utilizing Table 9.3.2 (Cohen, 1987) $\alpha = 0.05$; N = 63 | | | | |
|---|---|---|---|---|
| **Effect Size** | **$f^2$** | **v** | **L** | **Power** |
| Small | .02 | 61 | 1.22 | * |
| Medium | .15 | 61 | 9.15 | .856 |
| Large | .35 | 61 | 21.35 | .99 |

* Value of L was too small for entering Cohen (1987) Table 9.3.2

**Table 4: Power Analysis for Hypothesis 4**

| Utilizing Table 9.3.2 (Cohen, 1987) $\alpha = 0.05$; N = 63 | | | | |
|---|---|---|---|---|
| **Effect Size** | **$f^2$** | **v** | **L** | **Power** |
| Small | .02 | 60 | 1.2 | * |
| Medium | .15 | 60 | 9.0 | .77 |
| Large | .35 | 60 | 21.0 | .99 |

* Value of L was too small for entering Cohen (1987) Table 9.3.2

**Table 5: Power Analysis for Hypothesis 5**

| Utilizing Table 9.3.2 (Cohen, 1987) $\alpha = 0.05$; N = 112 | | | | |
|---|---|---|---|---|
| **Effect Size** | **$f^2$** | **v** | **L** | **Power** |
| Small | .02 | 110 | 2.2 | .313 |
| Medium | .15 | 110 | 16.5 | .983 |
| Large | .35 | 110 | 38.5 | .99 |

**Table 6: Power Analysis for Hypothesis 6**

| Utilizing Table 9.3.2 (Cohen, 1987) $\alpha = 0.05$; N = 54 | | | | |
|---|---|---|---|---|
| **Effect Size** | **$f^2$** | **v** | **L** | **Power** |
| Small | .02 | 52 | 1.04 | * |
| Medium | .15 | 52 | 7.8 | .798 |
| Large | .35 | 52 | 18.2 | .99 |

* Value of L was too small for entering Cohen (1987) Table 9.3.2

**Results**

Table 7 shows the results of the Pearson correlations of the constructs within the model, while Table 8 provides a consolidated view of the linear regression results. It is important to note that there are two forms of the emotional exhaustion construct in Table 7, but only one in the model. One shows the change in mean emotional exhaustion between times 1 and 2, while the other one shows the mean level of emotion exhaustion at Time 1. These two forms of the emotional exhaustion construct are needed, because in order to regress the daily use of miscellaneous medication, which was recorded at Time 1 only, with emotional exhaustion, a Time 1 mean of emotional exhaustion was required. A detailed output for each regression can be found at Appendix F.

**Table 7: Pearson Correlations of Constructs**

| | | Delta of Mot. | Delta of BMI | Delta of Emo. Exhaust | Emo. Exhaust (Time 1) | Misc. Meds (Time 1) | Delta of LDL |
|---|---|---|---|---|---|---|---|
| Delta of Motivation | Pearson Correlation | | | | | | |
| Delta of BMI | Pearson Correlation | -.376* | | | | | |
| Delta of Emotional Exhaustion | Pearson Correlation | -.186 | .377* | | | | |
| Emotional Exhaustion (Time 1) | Pearson Correlation | .032 | -.227 | -.354* | | | |
| Misc. Meds (Time 1) | Pearson Correlation | -.010 | -.116 | -.021 | .256* | | |
| Delta of LDL | Pearson Correlation | -.058 | .304* | .289* | -.117 | -.068 | |

* Significant at the $p < .05$ level

**Table 8: Consolidated Results of Linear Regressions**

| Hypothesis | Unstandardized Beta | Standardized Beta (β) | $R^2$-value | F-ratio (*df*) | Significance |
|---|---|---|---|---|---|
| H1 | -.724 | -.376 | .141 | 10.033 (1, 61) | .002 |
| H2 | .248 | .377 | .142 | 10.082 (1, 61) | .002 |
| H3 | -.236 | -.186 | .035 | 2.195 (1, 61) | .144 |
| H4* | Ind. Var. = -.066<br>Mediator = .235 | Ind. Var. = -.052<br>Mediator = .357 | .144 | 5.054 (2, 60) | .009 |
| H5 | .072 | .256 | .066 | 7.713 (1, 110) | .006 |
| H6 | 5.721 | .289 | .083 | 4.731 (1, 52) | .034 |

* Values are for step 3 of the Baron and Kenny (1986) test for mediation: dependent variable regressed on mediator and independent variable

When evaluating the hypotheses, it is important to consider the Pearson's correlation coefficient, the standardized Beta, the $R^2$-value, the F-ratio, and the significance (Field, 2009). In the case of single variable regressions, such as Hypotheses 1, 2, 3, 5, and 6, the magnitude of the Pearson's correlation coefficient represents the overall fit of the regression model (Field, 2009). Pearson's correlation coefficient is also a measure of effect size. The standardized Beta indicates the strength of the relationship between the independent and dependent variables by representing the amount of change in the dependent variable that will be observed based on a single unit change in the independent variable (Field, 2009). The $R^2$-value represents that amount of variation in the dependent variable that can be explained by the independent variable (Field, 2009). The F-ratio indicates the average amount of variability in the data that the model can explain, compared to the amount it cannot explain; an F-ratio of greater than 1 is desirable, because this means that the amount of variability in the data that the model can explain is greater than the amount that it cannot explain (Field, 2009). The significance indicates if the independent variable is making a significant contribution to the outcome of the dependent variable; a significance of $< .05$ is indicative of a genuine effect by the independent variable (Field, 2009).

***Hypothesis 1***

Hypothesis 1, "motivation for a healthy lifestyle has a negative relationship with BMI," was supported ($\beta = -.376$, $p < .05$). The Pearson's correlation coefficient (-.376) is greater than the estimated large effect size (.35), thus yielding a power (.99) well above the required .8. The negative sign on the Pearson's coefficient indicates that the hypothesized negative relationship is supported. The $R^2$-value of .141 indicates that a change in motivation for a healthy lifestyle accounts for 14.1% of the variance in the change in BMI, and the F-ratio ($F(1,61) = 10.033$, $p = .002$) indicates that the amount of explainable variance is greater than the amount of unexplainable variance. The relationship between the independent and dependant variables is significant ($p < .05$), thereby indicating that a change in motivation is negatively related to a change in BMI.

***Hypothesis 2***

Hypothesis 2, "BMI has a positive relationship with emotional exhaustion," was supported ($\beta = .377$, $p < .05$). The Pearson's correlation coefficient (.377) is greater than the estimated large effect size (.35), thus, yielding a power (.99) well above the required .8. The positive sign on the Pearson's coefficient indicates that the hypothesized positive relationship is supported. The $R^2$-value of .142 indicates that a change in BMI accounts for 14.2% of the variance in the change in emotional exhaustion, and the F-ratio ($F(1, 61) = 10.082$, $p = .002$) indicates that the amount of explainable variance is greater than the amount of unexplainable variance. The relationship between the independent and dependant variables is significant ($p < .05$), thereby indicating that a change in BMI is positively related to emotional exhaustion.

***Hypothesis 3***

Hypothesis 3, “motivation for a healthy lifestyle has a negative relationship with emotional exhaustion,” was not supported ($\beta = -.186$, $p > .05$); ($F(1, 61) = 2.195$, $p = .144$). The Pearson’s coefficient of -.186 indicates that the effect size is sufficient to produce adequate power, as it is greater than the medium estimated effect size of .15 that produces a power of 0.856. The hypothesis is not supported because the significance ($p > .05$) indicates that a change in motivation does not contribute to the change in emotional exhaustion.

***Hypothesis 4***

Hypothesis 4, “BMI will partially mediate the relationship between motivation for a healthy lifestyle, and emotional exhaustion,” was not supported. When conducting the Baron and Kenny (1986) test for mediation, the independent variable (motivation for a healthy lifestyle) did not have a significant effect on the dependent variable (emotional exhaustion) ($\beta = -.186$, $p > .05$); this is the same relationship as Hypothesis 3. Condition two of the Baron and Kenny (1986) test was not met; therefore, mediation cannot be supported. It is important to note that even though the independent variable was not significant at the $p < .05$ level, it would be significant at a $p < .15$ level. This relaxed significance requirement would increase the possibility of falsely concluding that a genuine effect exists, but not at such a dramatic fashion as to exclude the possibility that the mediator may fully mediate the relationship between the independent and dependent variables. Full mediation is present "if the independent variable has no effect when the mediator is controlled" (Baron & Kenny, 1986). When the dependent variable is regressed simultaneously on the mediator and the independent variable ($F(2, 60) = 5.054$, $p = .009$), the mediator is significant ($\beta = .357$, $p < .05$) and the independent variable ($\beta = -.052$, $p > .05$) is far enough above .05 as to indicate that it has no effect. Therefore, it is possible that a change in BMI may fully mediate the relationship between a change in motivation for a healthy lifestyle and a change in emotional exhaustion.

***Hypothesis 5***

Hypothesis 5, "emotional exhaustion will have a positive relationship with daily medication use," was supported ($\beta = .256$, $p < .05$). The Pearson's correlation coefficient (.256) is greater than the estimated medium effect size (.15), thus yielding a power (.983) well above the required 0.8. The positive sign on the Pearson's coefficient indicates that the hypothesized positive relationship is supported. The $R^2$-value of .066 indicates that emotional exhaustion at Time 1 accounts for 6.6% of the variance in the change in emotional exhaustion, and the F-ratio ($F(1, 110) = 7.713$, $p = .006$) indicates that the amount of explainable variance is greater than the amount of unexplainable variance. The relationship between the independent and dependant variables is significant ($p < .05$), thereby indicating that emotional exhaustion at Time 1does have a significant positive relationship to daily miscellaneous medication use at Time 1.

***Hypothesis 6***

Hypothesis 6, "emotional exhaustion will have a positive relationship with LDL," was supported ($\beta = .289$, $p < .05$). The Pearson's correlation coefficient (.289) falls in between the predefined medium and large effect sizes in Table 6, with the medium effect size producing a power slightly below the required .8 and large effect size producing a power of .99. When utilizing the Pearson's coefficient value of .289 as a substitute for the effect size, the corresponding value of L is 15.028. When entering Cohen's (1987) Table 9.3.2 with L = 15.028 and one independent variable, the power provided is about .97, which is well above the required .8. The positive sign on the Pearson's coefficient indicates that the hypothesized positive relationship is supported. The $R^2$-value of .083 indicates that a change in emotional exhaustion accounts for 8.3% of the variance in the change in LDL, and the F-ratio ($F(1, 52) = 4.731$, $p = .034$) indicates that the amount of explainable variance is greater than the amount of unexplainable variance. The relationship between the independent and dependant variables is significant ($p < .05$), thereby, indicating that a change in emotional exhaustion is positively related to the change in LDL.

## IV. Discussion & Conclusion

The purpose of this research has been to examine how behavioral indicators are related to physiological responses. A theoretical model was built and tested in order to evaluate hypothesized relationships between motivation for a healthy lifestyle and emotional exhaustion as well as the subsequent relationship of emotional exhaustion with the physical outcomes of daily medication usage and low-density lipoprotein. This research has addressed a gap in the existing literature by beginning to integrate behavioral, psychological, and physiological constructs. As Heaphy and Dutton (2008) said, "human physiology deserves greater attention in organizational research." If the relationships found in this research hold, then that would be additional justification to pursue identifying potential causal relationships between behavioral indicators and physical outcomes.

### Theoretical Implications

Three theories were utilized to build the theoretical model: Conservation of Resources (COR) Theory, Theory of Planned Behavior, and the Theory of Achievement Motivation. As the predominate theory in the model, the COR theory appears to have fit the model fairly well. The hypotheses that were directly underpinned by the COR theory (2, 5, and 6) were all supported by the results of the linear regressions. In Hypothesis 2, the additional physical type of energy resources gained by a reduction in BMI could be said to have aided in reducing the emotional exhaustion experienced at work. The subsequent reduction in emotional exhaustion could be said to have led to a reduction in daily medication regimens and reduced LDL, each of which are factors contributing to overall good health.

The Theories of Planned Behavior and Achievement Motivation appear to be good fits for the proposed relationship between an individual's motivation for a healthy lifestyle and their BMI. Hypothesis 1 was supported by the results of the linear regression. This supports the theory that an individual will engage in the behaviors necessary to achieve success in the activities in which they desire to succeed, and that their motivation to succeed is a function of the strength of their motive, their expectancy to succeed when engaging in those activities, and the value of their incentive. In the case of Hypothesis 1, those activities were participation in physical exercise and healthier eating, which led to a reduction in BMI.

Hypotheses 3 and 4 were not supported by the results of the regressions. Hypothesis 3 was the proposed negative relationship between an individual's motivation for a healthy lifestyle and their emotional exhaustion, based on the idea that motivation could be carried over from the non-work to the work environment. The lack of significant findings does not support the idea of motivation being a non-directional, general drive. Hypothesis 4 was the proposed partial mediation of the Hypothesis 3 relationship by BMI. It is important to note that the relationship may be closer to full mediation than partial, but that the non-significance of Hypothesis 3 resulted in failure of the Baron and Kenny (1986) test for mediation. Consideration should be given to testing if full mediation can be supported, possibly utilizing a combined construct of BMI and waist circumference, as the combination of the two has been shown to be a better predictor of obesity- related health issues than BMI alone (Janssen et al., 2004).

## Managerial Implications

This research could be beneficial to organizations looking for ways to reduce emotional exhaustion in their employees. This research has reviewed existing studies highlighting the effective use of a healthy lifestyle to reduce burnout, anxiety, and absenteeism, while fostering engagement and cohesion (Cook et al., 2007; Eastman, 1996; Fall et al., 2003; Focht & Koltyn, 1999; Long & van Stavel, 1995; Mills et al., 2007; Stockton et al., 1992). It also presented further empirical evidence that reducing BMI can aid in reducing emotional exhaustion. Additionally, it presented empirical evidence for relationships between emotional exhaustion and daily medication usage, as well as emotional exhaustion and LDL, a contributing factor to arteriosclerosis and cardiovascular disease (Melamed et al., 1992; Worsiewicz, 1991). This research also has specific implications to the U.S. Air Force since all the participants in the study were Air Force employees. The Air Force is currently facing budgetary reductions and looking for ways to reduce costs. One such way to reduce financial obligations would be to reduce employee medical costs. This research has shown that reducing emotional exhaustion may lead to reductions in medication need, as well as reductions in factors contributing to required medications, such as LDL.

## Limitations of the Research

The use of the archival dataset presents a couple of limitations to this research. The first limitation is that all the participants in the study had to possess two of the seven criteria that placed them at increased health risk. This presents a limit to the generalizability since not all people possess two of those specific entry criteria. The presence of these entry criteria may have predisposed them to the observed physiological response, thereby bringing into question the observed effect of the predictor variables in the regressions.

A second limitation inherent with the archival dataset is the accuracy and consistency of the self-reported survey data. Self-reported data has the potential to be manipulated by the individual, either unintentionally or maliciously. Individuals may misreport an item because they are embarrassed by what it says about them, or they may have just misunderstood what the item was asking. User error or manipulation can also create issues with regard to consistency between their answers within each construct being measured. User reluctance to take a side on a specific topic and/or item can cause problems in regard to obtaining statistically significant results. As in the case of the seven-point Likert scale utilized by the archival dataset to gauge emotional exhaustion, a participant has the opportunity to answer each question in the middle, rather than taking a side of either agreement or disagreement with the statement given; this could reduce the chance of observing a significant effect between the independent and dependent variables. A particular strength of this research is that the constructs of the model incorporated survey data, anthropometric measures, and physiological data. The construct measurements were also broken up over time. This helps to buffer potential threats to validity of self-reported survey data.

A third limitation presented by the archival dataset is due to the attrition of participants experienced from Time 1 to Time 2 of the study. This attrition reduced the sample size significantly, especially the number of participants that were willing to provide blood samples at Time 2. The reduced sample size did not create a statistical power issue for any of the regressions necessary for testing this model, but it did preclude the possibility of using more statistically rigorous analysis methods, such as structural equation modeling or path analysis. The small sample size also limits the number of independent variables that can be used as predictors before the statistical power becomes too low. In order to minimize the effect of participant attrition, a one-way ANOVA was conducted to examine if there was a significant difference between those individuals who stayed and those who dropped out. No significant difference was found ($p < .05$).

**Recommendations for Future Research**

Future research in the constructs discussed in this research may include utilizing healthy individuals for a replication of the study conducted at WPAFB. This would increase the generalizability of the findings to an audience beyond those already possessing factors known to be health adverse. Another recommendation would be to expand the use of anthropometric and physiological indices. Studies have shown that a model incorporating waist circumference and BMI may be superior to one utilizing BMI alone (Janssen et al., 2002; Janssen et al., 2004). As was discussed in Chapter II, links between stress, ill-health, and the body’s stress hormones have been well documented; therefore, incorporating physiological indicator from the stress hormones may be beneficial. A third recommendation for future research is to incorporate a leader directed/led exercise and diet program. The dataset utilized for this research employed self-led exercise and diet regimens that were self-reported by the participants at the end of the study. A study that incorporates a leader to direct or lead the exercise and diet program could provide greater fidelity to the exercise and diet data, possibly yielding significant results for the effects of specific types of exercises. An exercise and diet program with a leader may also provide the opportunity of evaluating the potential benefits of group participation in a program, as opposed to a personal trainer approach.

**Concluding Thoughts**

Chapter I presented the research question of, "How are behavioral indicators related to physiological responses?" Upon completion of this research, the research question was partially answered. The usefulness of behavioral indicators to predict physiological responses is supported by the evidence; it is possible to see a relationship between motivation for a healthy lifestyle and low-density lipoprotein, but through BMI and emotional exhaustion. In some ways, the research question is only partially answered since the study participants all had pre-existing conditions that may have predisposed them to the observed physiological response. More research is needed to further explore the potential of predicting physiological responses through behavioral indicators, but this research addressed the need to incorporate physiological indicators in behavioral research (Heaphy & Dutton, 2008).

# Bibliography


Ahola, K., Honkonen, T., Virtanen, M., Kivimaki, M., Isometsa, E., Aromaa, A., & Lonnqvist, J. (2007). Interventions in relation to occupational burnout: The population-based health 2000 study. *Journal of Occupational and Environmental Medicine*, *49*(9), 943-952.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*

Aldana, S. G., & Pronk, N. P. (2001). Health promotion programs, modifiable health risks, and employee absenteeism. *Journal of Occupational and Environmental Medicine*, *43*(1), 36-46.

Altchiler, L., & Motta, R. (1994). EFFECTS OF AEROBIC AND NONAEROBIC EXERCISE ON ANXIETY, ABSENTEEISM, AND JOB SATISFACTION. *Journal of Clinical Psychology, 50*(6), 829-840.

Arnetz, B. B. (1984). The potential role of psychosocial stress on levels of hemoglobin $A_{1c}$ ($HbA,_{1c}$) and fasting plasma glucose in elderly people [Abstract]. *Journal of Gerontology*, *39*(4) 424-429. doi:10.1093/geronj/39.4.424

Atkinson, J. W., & Feather, N. T. (Eds.). (1966). *A theory of achievement motivation* (1st ed.). Huntington, New York: Robert E. Krieger Publishing Co., Inc.

Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2005). The crossover of burnout and work engagement among working couples. *Human Relations, 58*(5), 661-689. doi:10.1177/0018726705055967

Bakker, A. B., Schaufeli, W. B., Leiter, M. P., & Taris, T. W. (2008). Work engagement: An emerging concept in occupational health psychology. *Work & Stress, 22*(3), 187-201.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Bellingrath, S., Weigl, T., & Kudielka, B. M. (2009). Chronic work stress and exhaustion is associated with higher allostastic load in female school teachers. *Stress, 12*(1), 37-48. doi:10.1080/10253890802042041

Brand, S., Beck, J., Hatzinger, M., Harbaugh, A., Ruch, W., & Holsboer-Trachsler, E. (2010). Associations between satisfaction with life, burnout-related emotional and physical exhaustion, and sleep complaints. *World Journal of Biological Psychiatry, 11*(5), 744-754. doi:10.3109/15622971003624205

Brown, J. S. (Ed.). (1961). *The motivation of behavior* (1st ed.). New York: McGraw-Hill.

Calle, E. E., Thun, M. J., Petrelli, J. M., Rodrequez, C., & Heath, C. W. (1999). Body-mass index and mortality in a prospective cohort of U.S. adults. *The New England Journal of Medicine, 341*(15), 1097-1105.

Cohen, J. (1987). *Statistical power analysis for the behavioral sciences*. Hillsdale: Lawrence Erlbaum Associates, Inc.

Cook, R. F., Billings, D. W., Hersch, R. K., Back, A. S., & Hendrickson, A. (2007). A field test of a web-based workplace health promotion program to improve dietary practices, reduce stress, and increase physical activity: Randomized controlled trial. *Journal of Medical Internet Research, 9*(2), 1-27. doi:10.2196/jmir.9.2.e17

Cordes, C. L., & Dougherty, T. W. (1993). A REVIEW AND AN INTEGRATION OF RESEARCH ON JOB BURNOUT [Abstract]. *The Academy of Management Review*, *18*(4) 621-656.

Dallman, M. F., Pecoraro, N., Akana, S. F., la Fleur, S. E., Gomez, F., Houshyar, H., . . . Manolo, S. (2003). Chronic stress and obesity: A new view of "comfort food". *PNAS, 100*(20), 11696-11701.

Dansinger, M. L., Tatsioni, A., Wong, J. B., Chung, M., & Balk, E. M. (2007). Meta-analysis: The effect of dietary counseling for weight loss. *Annals of Internal Medicine*, *147*(1), 41-50.

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research [Abstract]. *Psychological Bulletin, 130*(3) 355-391.

Dzewaltowski, D. A. (1989). Toward a model of exercise motivation [Abstract]. *Journal of Sports & Exercise Psychology, 11*(3) 251-269.

Eastman, W. (1996). Avoiding faculty burnout through the wellness approach. *Annual Conference of the Association of Canadian Community Colleges,* Toronto, Ontario, Canada.

Elliot, G. R., & Eisdorfer, C. (1982). *Stress and human health: Analysis and implications of research*. New York, NY: Springer Publishing Company, LLC.

Elmer, P. J., Obarzanek, E., Vollmer, W. M., Simons-Morton, D., Stevens, V. J., Young, D. R., . . . Appel, L. J. (2006). Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Annals of Internal Medicine, 144*(7), 485-495.

Epel, E. S., McEwen, B. S., & Ickovics, J. R. (1998). Embodying psychological thriving: Physical thriving in response to stress. *Journal of Social Issues, 54*(2), 301-322.

Evans, G. W., Lercher, P., Meis, M., Ising, H., & Kofler, W. W. (2001). Community noise exposure ans stress in children. *Journal of the Acoustical Society of America, 109*(3), 1023-1027.

Fall, M. L., Wolf, K. N., Schiller, M. R., & Wilson, S. L. (2003). Dietetic technicians report low to moderate levels of burnout. *Journal of the American Dietetic Association, 103*(11), 1520-1522. doi:10.1016/j.jada.2003.08.018

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Thousand Oaks: SAGE Publications Inc.

Focht, B. C., & Koltyn, K. F. (1999). Influences of resistance exercise of different intensitieson state anxiety and blood pressure. *Medicine & Science in Sports & Exercise, 31*(3), 456-463.

Frankel, H. M., & Staeheli, J. C. (1992). Calculating body mass index. *Annals of Internal Medicine, 117*(8), 698-699.

Fulton, J. F. (Ed.). (1950). *Textbook of physiology* (16th ed.). Philadelphia: W.B. Saunders Company.

Galantino, M. L., Baime, M., Maquire, M., Szapary, P., & Farrar, J. T. (2005). Association of psychological and physiological measures of tress in healthcare professionals during an 8-week mindfulness meditation program: Mindfulness in practice. *Stress & Health: Journal of the International Society for the Investigation of Stress, 21*(4), 255-261.

Goetzel, R. Z., Ozminkowski, R. J., Bruno, J. A., Rutter, K. R., Isaac, F., & Wang, S. (2002). The long-term impact of johnson & johnson's health & wellness program on employee health risks. *Journal of Occupational and Environmental Medicine, 44*(5), 417-424.

Gonzalez-Roma, V., Schaufeli, W. B., Bakker, A. B., & Lloret, S. (2006). Burnout and work engagement: Independent factors or opposite poles? *Journal of Vocational Behavior*, *68*, 165-174.

Green, S. B. (1991). How many subjects does it take to do A regression analysis? *Multivariate Behavioral Research*, *26*(3), 499-510.

Grossi, G., Perski, A., Evengard, B., Blomkvist, V., & Orth-Gomer, K. (2003). Physiological correlates of burnout among women. *Journal of Psychosomatic Research*, *55*, 309-316.

Hakanen, J. J., Bakker, A. B., & Schaufeli, W. B. (2006). Burnout and work engagement among teachers. *Journal of School Psychology, 43*, 495-513.

Harries, K. (1997). SOCIAL STESS AND TRAUMA: SYNTHESIS AND SPATIAL ANALYSIS. *Social Science Medicine, 45*(8), 1251-1264.

Heaphy, E. D., & Dutton, J. E. (2008). POSITIVE SOCIAL INTERACTIONS ND THE HUMAN BODY AT WORK: LINKING ORGANIZATIONS AND PHYSIOLOGY. *Academy of Management Review, 33*(1), 137-162.

Herbert, T. B., & Cohen, S. (1993). Stress and immunity in humans: A meta-analytic review [Abstract]. *Psychosomatic Medicine, 55*(4) 364-379.

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*(3), 513-524.

Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology, 6*(4), 307-324. doi:10.1037/1089-2680.6.4.307

Hughes, J. R., Casal, D. C., & Leon, A. S. (1986). Psychological effects of exercise: A randomized cross-over trial. *Journal of Psychosomatic Research, 30*(3), 355-360. doi:DOI: 10.1016/0022-3999(86)90013-9

Ilies, R., Dimotakis, N., & De Pater, I. E. (2010). Psychological and physiological reactions to high workloads: Implications for well-being. *Personnel Psychology, 63*(2), 407-436.

James, G. D., & Brown, D. E. (1997). THE BIOLOGICAL STRESS RESPONSE AND LIFESTYLE: Catecholamines and blood pressure. *Annual Review of Anthropology*, *26*, 313-335.

Janssen, I., Katzmarzyk, P. T., & Ross, R. (2002). Body mass index, waist circumference, and health risk. *Archives of Internal Medicine, 162*, 2074-2079.

Janssen, I., Katzmarzyk, P. T., & Ross, R. (2004). Waist circumference and not body mass index explains obesity-related health risk. *The American Journal of Clinical Nutrition, 79*(3), 379-384.

Juster, R., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience & Biobehavioral Reviews*, *35*(1), 2-16. doi:DOI: 10.1016/j.neubiorev.2009.10.002

Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. *The Academy of Management Journal, 33*(4), 692-724.

Kaplan, R. M., Hartwell, S. L., Wilson, D. K., & Wallace, J. P. (1987). Effects of diet and exercise interventions on control and quality of life in non-insulin-dependent diabetes mellitus. *Journal of General Internal Medicine, 2*(4), 220-228. doi:10.1007/BF02596443

Kilpatrick, M., Hebert, E., & Bartholomew, J. (2005). College students' motivation for physical activity: Differentiating men's and women's motives for sport participation and exercise [Abstract]. *Journal of American College Health, 54*(2) 87-94.

Kobasa, s. C., Maddi, S. R., & Puccetti, M. C. (1982). Personality and exercise as buffers in the stress-illness relationship [Abstract]. *Journal of Behavioral Medicine, 5*(4) 391-404. doi:10.1007/BF00845369

Kuhnel, J., Sonnentag, S., & Westman, M. (2009). Does work engagement increase after a short respite? the role of job involvement as a double-edged sword. *Journal of Occupational and Organizational Psychology*, *82*, 575-594.

Laaksonen, D. E., Lindstrom, J., Lakka, T. A., Eriksson, J. G., Niskanen, L., Wikstrom, K., . . . Uusitupa, M. (2005). Physical activity in the prevention of type 2 diabetes. *Diabetes, 54*, 158-165.

Langelaan, S., Bakker, A. B., van Doornen, L. J. P., & Schaufeli, W. B. (2006). Burnout and work engagement: Do individual differences make a difference? *Personality and Individual Differences, 40*, 521-532.

Latham, G. P., & Pinder, C. C. (2005). Work motivation theory and research at the dawn of the twenty-first century. *Annual Review of Psychology, 56*, 485-516.

Laurie, L. (2001). Dealing with stress, burnout, and grief in the practice of oncology. *The Lancet Oncology, 2*(12), 750-755. doi:10.1016/S1470-2045(01)00590-3

Lindeberg, S. I., Eek, F., Lindbladh, E., Östergren, P., Hansen, Å. M., & Karlson, B. (2008). Exhaustion measured by the SF-36 vitality scale is associated with a flattened diurnal cortisol profile. *Psychoneuroendocrinology, 33*(4), 471-477. doi:10.1016/j.psyneuen.2008.01.005

Linden, W., Lenz, J. W., & Con, A. H. (2001). Individual stress management for primary hypertension. *Archives of Internal Medicine, 161*, 1071-1080.

Lisspers, J., Sundin, O., Hofman-Bang, C., Nordlander, R., Nygren, A., Ryden, L., & Ohman, A. (1999). BEHAVIORAL EFFECTS OF A COMPREHENSIVE, MULTIFACTORIAL PROGRAM FOR LIFESTYLE CHANGE AFTER PERCUTANEOUS TRANSLUMINAL CORONARY ANGIOPLASTY: A

PROSPECTIVE, RANDOMIZED, CONTROLLED STUDY. *Journal of Psychosomatic Research, 46*(2), 143-154.

Llorens, S., Schaufeli, W., Bakker, A., & Salanova, M. (2007). Does a positive gain spiral of resources, efficacy beliefs and engagement exist? *Computers in Human Behavior*, *23*(1), 825-841. doi:DOI: 10.1016/j.chb.2004.11.012

Long, B. C., & van Stavel, R. (1995). Effects of exercise training on anxiety: A meta-analysis [Abstract]. *Journal of Applied Sport Psychology, 7*(2) 167-189.

Lu, L. (1999). Work motivation, job stress and employees' well-being. *Journal of Applied Management Studies, 8*(1), 61-72.

Maslach, C. (2003). Job burnout: New directions in research and intervention [Abstract]. *Current Directions in Psychological Science, 12*(5) 189-192. doi:10.1111/1467-8721.01258

Mauno, S., Kinnunen, U., & Ruokolainen, M. (2007). Job demands and resources as antecedents of work engagement: A longitudinal study. *Journal of Vocational Behavior, 70*(1), 149-171. doi:DOI: 10.1016/j.jvb.2006.09.002

Maxwell, S. E. (2000). Sample size and multiple regression analysis. *Psychological Methods, 5*(4), 434-458.

McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine, 338*(3), 171-179.

McEwen, B. S. (2004). Protection and damage from acute and chronic stress: Allostasis and allostatic overload and relevance to the pathophysiology of psychiatric disorders. *Annals of the New York Academy of Sciences, 1032*(1), 1-7. doi:10.1196/annals.1314.001

Melamed, S., Kushnir, T., & Shirom, A. (1992). Burnout and risk factors for cardiovascular diseases [Abstract]. *Behavioral Medicine, 18*(2) 53-60.

Melamed, S., Ugarten, U., Shirom, A., Kahana, L., Lerman, Y., & Froom, P. (1999). CHRONIC BURNOUT, SOMATIC AROUSAL AND ELEVATED SALIVARY CORTISOL LEVELS. *Journal of Psychosomatic Research, 46*(6), 591-598.

Miller, W. C., Koceja, D. M., & Hamilton, E. J. (1997). A meta-analysis of the past 25 years of weight loss research using diet, exercise or diet plus exercise intervention. *International Journal of Obesity, 21*, 941-947.

Mills, P. R., Kessler, R. C., Cooper, J., & Sullivan, S. (2007). Impact of a health promotion program on employee health risks and work productivity. *American Journal of Health Promotion, 22*(1), 45-52.

National Institutes of Health.*Body mass index table.* Retrieved 1/16, 2012, from http://www.nhlbi.nih.gov/guidelines/obesity/bmi_tbl.pdf

National Institutes of Health. (2010). *The kidneys and how they work.* Retrieved 12/5, 2011, from http://kidney.niddk.nih.gov/kudiseases/pubs/yourkidneys/

Pinto, B. M., Maruyama, N. C., Clark, M. M., Cruess, D. G., Park, E., & Roberts, M. (2002). Motivation to modify lifestyle risk behaviors in women treated for breat cancer. *Mayo Clinic Proceedings, 77*, 122-129.

Plonczynski, D. J. (2000). Measurement of motivation for exercise. *Health Education Research*, *15*(6), 695-705.

Podsakoff, N. P., Lepine, J. A., & LePine, M. A. (2007). Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: A meta-analysis. [Abstract]. *Journal of Applied Psychology*, *92*(2) 438-454. doi:10.1037/0021-9010.92.2.438

Pompili, M., Rinaldi, G., Lester, D., Girardi, P., Ruberto, A., & Tatarelli, R. (2006). Hopelessness and suicide risk emerge in psychiatric nurses suffering from burnout and using specific defense mechanisms. *Archives of Psychiatric Nursing*, *20*(3), 135-143. doi:10.1016/j.apnu.2005.12.002

Porges, S. W. (1995). Cardiac vagal tone: A physiological index of stress. *Neuroscience & Biobehavioral Reviews*, *19*(2), 225-233.

Rodell, J. B., & Judge, T. A. (2009). *The good, the bad, and the ugly of stress at work.* Retrieved 3/7, 2011, from http://www.ioatwork.com/ioatwork/2010/01/the-good-the-bad-the-ugly-of-stress-at-work

Salanova, M., Agut, S., & Peiro, J. M. (2005). Linking organizational resources and work engagement to employee performance and customer loyalty: The mediation of service climate. *Journal of Applied Psychology, 90*(6), 1217-1227.

Salmon, P. (2001). EFFECTS OF PHYSICAL EXERCISE ON ANXIETY, DEPRESSION, AND SENSITIVITY TO STRESS: A UNIFYING THEORY. *Clinical Psychology Review, 21*(1), 33-61.

Schabracq, M. J., Winnubst, J. A. M., & Cooper, C. L. (Eds.). (2003). *The handbook of work and health psychology* John Wiley & Sons, Ltd.

Schaufeli, W. B., Salanova, M., Gonzalez-Roma, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytical approach. *Journal of Happiness Studies, 3*, 71-92.

Schultz, A. B., & Edington, D. W. (2007). Employee health and presenteeism: A systematic review [Abstract]. *Journal of Occupational Rehabilitation, 17*(3) 547-579.

Segerstrom, S. C., & Miller, G. E. (2004). Psychological stress and the human immune system: A meta-analytic study of 30 years of inquiry. *Psychological Bulletin, 130*(4), 601-630. doi:10.1037/0033-2909.130.4.601

Shirom, A., Westman, M., Shamai, O., & Carel, R. S. (1997). Effects of work overload and burnout on cholesterol and triglycerides levels: The moderating efffects of emotional reactivity among male and female employees [Abstract]. *Journal of Occupational Health Psychology, 2*(4) 275-288.

Shraga, O., & Shirom, A. (2009). The construct validity of vigor and its antecedents: A qualitative study. *Human Relations, 62*(2), 271-291. doi:10.1177/0018726708100360

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7*(4), 422-445.

Sonnenschein, M., Sorbi, M. J., van Doornen, L. J. P., Schaufeli, W. B., & Maas, C. J. M. (2007). Evidence that impaired sleep recovery may complicate burnout improvement independently of depressive mood. *Journal of Psychosomatic Research*, *62*, 487-494.

Sonnentag, S. (2003). Recovery, work engagement, and proactive behavior: A new look at the interface between nonwork and work. *Journal of Applied Psychology, 88*(3), 518-528.

Standage, M., Sebire, S. J., & Loney, T. (2008). Does exercise motivation predict engagement in objectively assessed bouts of moderate-intensity exercise?: A self-determination theory perspective. *Journal of Sports & Exercise Psychology, 30*, 337-352.

Steptoe, A., & Cox, S. (1988). Acute effects of aerobic exercise on mood. *Health Psychology, 7*(4), 329-340.

Stockton, R., Rohde, R. I., & Haughey, J. (1992). The effects of structured group exercises on cohesion, engagement, avoidance, and conflict [Abstract]. *Small Group Research*, 155-168. doi:10.1177/1046496492232001

Teixeira, P., Going, S., Houtkooper, L., Cussler, E., Metcalfe, L., Blew, R., . . . Lohman, T. (2006). Exercise motivation, eating, and body image variables as predictors of weight control [Abstract]. *Medicine & Science in Sports & Exercise, 38*(1) 179-188.

Tekur, P., Singphow, C., Romarao Nagendra, H., & Raghuram, N. (2008). Effect of short-term intensive yoga program on pain, functional disability and spinal flexibility in chronic low back pain: A randomized control study. *The Journal of Alternative and Complementary Medicine, 14*(6), 637-644. doi:10.1089/acm.2007.0815

Toker, S., Shirom, A., Shapira, I., Berliner, S., & Melamed, S. (2005). The association between burnout, depression, anxiety, and inflammation biomarkers: C-reactive protein and fibrinogen in men and women. *Journal of Occupational Health Psychology, 10*(4), 344-362.

Ueno, T., Sugawara, H., Sujaku, K., Hashimoto, O., Tsuji, R., Tamaki, S., . . . Tanikawa, K. (1997). Therapeutic effects of restricted diet and exercise in obese patients with fatty liver. *Journal of Hepatology, 27*(1), 103-107. doi:10.1016/S0168-8278(97)80287-5

van Eck, M., Berkhof, H., Nicolson, N., & Sulon, J. (1996). The effects of perceived stress, traits, mood states, and stressful daily events on salivary cortisol. *Psychosomatic Medicine, 58*, 447-458.

Weiss, J. M., Glazer, H. I., Pohorecky, L. A., Brick, J., & Miller, N. E. (1975). **Effects of chronic exposure to stressors on avoidance-escape behavior and on brain norepinephrine***. *Psychosomatic Medicine, 37*(6), 522-534.

Wilfey, D., & Kunce, J. T. (1986). Differential physical and psychological effects of exercise. *Journal of Counseling Psychology, 33*(3), 337-342.

Wood, P. D., Stefanick, M. L., Dreon, D. M., Frey-Hewitt, B., Garay, S. C., Williams, P. T., . . . Haskell, W. L. (1988). Changes in plasma lipids and lipoproteins in overweight men during weight loss through dieting as compared with exercise. *N Engl J Med, 319*(18), 1173-1179. doi:10.1056/NEJM198811033191801

Worsiewicz, M. J. (Ed.). (1991). *Textbook of medical physiology* (8th ed.). Philadelphia: W.B. Saunders Company.

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2007). The role of personal resources in the job demands model. *International Journal of Stress Management, 14*(2), 121-141. doi:10.1037/1072-5245.14.2.121

Zeier, H., Brauchli, P., & Joller-Jemelka, H. I. (1996). Effects of work demands on immunoglobulin A and cortisol in air traffic controllers. *Biological Psychology*, *42*, 413-423.

# Appendix A

## Proposal for Clinical Investigation

### PROPOSAL FOR CLINICAL INVESTIGATION

***Effect of Dietary, Exercise, Motivational Interventions, and Goal-Setting Strategies on Positive Lifestyle Change and Reducing Health Risk Factors among Civilian Personnel with Various Disease Risk Parameters***

**J.F. Schlub, Ph.D., B. E. Moore, Ph.D., J. J. Elshaw, Ph.D., J. R. Jacobson, DO/MPH, M. A. Papio, RN, MBA/MS**

88 AMDS/SGPZ
7 August 2009

**1. PURPOSE OF INVESTIGATION:**

The purpose of this study is to determine if active intervention with education and support in motivation/goal setting strategies for positive lifestyle changes in the areas of fitness and nutrition positively affects risk for disease (metabolic syndrome, stroke, etc). Evaluation criteria are abdominal circumference (AC), inter-iliac crest (IC), weight (W), Body Mass Index (BMI), blood pressure (BP), abdominal height (AH), heart rate (HR), body temperature (BT), body fat (BF), abdominal strength (AS), aerobic fitness ($VO_2$ sub- max), arm strength (S), flexibility (F), resting metabolic rate (RMR), and blood sample analyses for lipids, C-reactive protein (CRP), blood glucose (G), hemoglobin A1C (HbA1C), homocysteine (HC), cortisol (C), and complete blood count with differentiation (CBC with diff.).

**Objectives:**

a. Identify and evaluate the possible roles of motivation/goal setting education in addition to nutrition and fitness for making positive lifestyle changes for decreasing the risks for mortality and morbidity as measured by AC, IC, W, BMI, BP, AH, HR, BT, S, F, BF, AS, RMR, VO2 sub-max, and blood lipids, CRP, G, HbA1C, HC, C and CBC with diff.

b. To determine the relationships among different measurements such as AC, IC, W, BMI, BP, AH, HR, BT, S, F, BF, AS, RMR, VO2 sub-max, and blood lipids, CRP, G, HbA1C, HC, C and CBC with diff. along with varying intervention methods.

c. To provide a framework for further study to determine what types of intervention (diet, exercise, motivation/counseling) improve life expectancy and quality of life as measured by AC, IC, W, BMI, BP, AH, HR, BT, S, F, BF, AS, RMR, VO2 sub-max and blood lipids, CRP, G, HbA1C, HC, C and CBC with diff.

d. To increase awareness of programs offered and to provide the incentive to participate in these programs.

e. To measure the effectiveness of motivational interventions and goal-setting strategies on program participation.

f. To foster a culture of wellness among civilian base personnel (AFI 40-101).

**BRIEF SUMMARY OF THE STUDY:**

The US population is ever increasing both in number and size. The number of adults considered "overweight" have exceeded 50% and those considered obese nearly 25%. The civilian population at Wright-Patterson Air Force Base consists of approximately 11,500 personnel (Civilian Personnel). Approximately 43% of this population are 50 years of age or older. With increasing age, the risks of developing health related diseases increase. Available data indicate that approximately 33.4% are overweight, with 14.6% considered to be obese and 3.8% morbidly obese (Civilian Health Promotion Services). In addition, it is estimated that 29.4-45.6% of the tested civilian population have at least one risk factor as indicated by plasma blood lipid levels (Civilian Health Promotion Services). The method by which people are labeled overweight usually refers to their body mass index and these indices have been correlated with increased health risks. In addition, it has been shown it is not only the amount of weight that increases health risks, but even more importantly, where it is carried. Research indicates that persons who are "apple" shaped (larger waist, smaller hips) have a greater health risk than pear shaped persons (larger hips and smaller waists). These risks are typically measured by blood profiles (lipids, A1C, glucose, etc.) as well as BMI and AC. In addition to the typical strategies for measuring these factors, AS, AH, RMR, HC and CBC with diff will be added to better assess and quantify risks and outcomes for assessing the effectiveness of behavior modification through motivational and goal setting strategies. These factors will be included within this study to help determine what factors play the greatest role in encouraging participants to make positive lifestyle changes.

While the current program offers facilities and education to all base personnel, participation in the offered programs is less than stellar. By recruiting persons into a study, it is hoped that greater awareness is achieved as well as increased motivation for participation. Effectiveness will be measured by numbers of participants in the offered programs as well as changes in physiological parameters. In addition to the current classes, participants in the treatment group will be required to attend an initial attendance in the motivational and goal setting class and will include strong encouragement to attend monthly motivational classes. Weekly specialized classes on various topics as well as current programs will be offered to participants for the duration of the trial.

Statistical analyses will be employed to examine the strength of predictions of various widely accepted body composition, anthropometric measurements and physiological markers and the effect of motivation/goal setting education on reducing cardiovascular and metabolic disease. Physiological parameters utilized will include blood pressure, anthropomorphic values, and lipid profiles, as well as complete blood counts with differentiation, HgbA1C, CRP, homocysteine and fasting blood glucose. It is the goal of this study to test the hypothesis that the addition of specific classes and support of behavioral modification and goal-setting strategies will make a more positive influence on lifestyle change than the opportunity to participate in fitness and nutrition programs alone.

The purpose of this study is to determine if specific interventions can decrease health risks as measured by the above parameters. Because motivation to change is a major factor in the successful application of known beneficial lifestyle changes (diet, exercise, etc.), determining the types of intervention which can positively effect change is invaluable to improving the quality of life for non-military personnel. All measurements will be taken at the beginning of the program and again upon completion. The types and amount of intervention will be compared to the measured physiological parameters to determine effectiveness. Statistical analyses will be employed to establish relationships among these factors in order to obtain more in-depth health risk factor analyses. From these data, it may be possible to predict what types of intervention work the most effectively among the base civilian population for reducing preventable morbidity and mortality health risk factors.

**Hypothesis** (Explanation): Motivation to change plays a major role in how effective programs are in promoting a healthy lifestyle. While having great programs, facilities and equipment available to all base personnel is a start to changing the culture to wellness, it is by no means a guarantee for success. Individuals must decide for themselves to make changes. Several factors may play a role in that decision. Good leadership, setting examples, team programs, positive feedback and encouragement, incentives to improve and proven goal setting strategies are ways to foster that change. Outcomes must be measurable and have a scientific basis. Physiological parameters can be utilized and are quantifiable, providing a means to determine how effective available programs are. Participants will be randomly assigned to either group, with (educational group) or without motivation and goal-setting strategies. These variables will be accounted for within the applied statistics. A brief medical questionnaire will be completed at the time of the first initial introduction to the study, when the ICD will also be administered. Reduction of health risks will be assessed and quantified by the physiological measurements of AC, IC, W, BMI, BP, AH, HR, BT, S, F,BF, AS, RMR , S, F, and blood lipids, CRP, G, HbA1C, HC, C and CBC with diff. By adding motivational education to the existing programs, it is hypothesized that civilians are more likely to stay motivated and make long term lifestyle changes that may reduce health risks and improve morbidity and mortality rates among our civilian population. These factors can then be utilized by way of prediction equations to better assess health risks and the effectiveness of intervention on positive lifestyle changes among civilians, which could decrease morbidity and mortality.

Treatments: Participants will be divided into two groups:

1. with motivation/ goal setting as an initial class, with monthly classes optional throughout the trial strongly encouraged; new media such as weekly emails and progress (group) reports will be included (AFIT resource)
2. no education in motivation/goal setting

Other Parameters:

1. all persons will have all other options the same (education, physical activity, etc.)
2. all persons will have blood drawn and analyzed at the beginning of the trial and at the end
3. types and numbers of classes, and nutrition and exercise (honor system) will be included

**Hypothesis** (Statistical): The addition of behavioral change support (education) increases participation of healthy lifestyle changes, resulting in the quantifiable improvement of measured health risk factors and program participation.

**Null hypothesis**: No correlation exits among these factors. Supporting behavioral change through motivation and goal setting has no effect on any other factors.

**Statistics**: Correlations among variables, standard deviation, variance analyses, confidence intervals, linear regression, prediction equations. Alpha = 0.05, 95$^{th}$ percentile, n= 100

Several published studies indicate that there are strong relationships for reducing health risks by making positive lifestyle changes. However, these relationships as well as included parameters have never been studied as they apply to the civilian population at WPAFB. In addition, the possible benefits of these studies will become more transparent as the number and types of measurements utilized to measure change improve. These new measurements include the addition of the IC, the combination of BF and RMR, AS, HC, C and CBC with diff., and will include the more common measurements such as blood lipids, glucose, etc. as listed above. This study will be expanded to include these parameters to better quantify health risks and to assess the effectiveness of intervention to cultural change and civilian health.

**Study Design**: Volunteers will be recruited from the civilian populace who meet the required health risk assessment standards. The objective is to determine which participants are most likely to benefit from intervention. Candidates must meet two of the following risk factor criteria: blood pressure>140/90; total cholesterol>240; body mass index>30; fasting blood glucose>140; waist>40 inches for men or waist>35 inches for women; smoking; aerobic exercise less than twice a week. From this pool, candidates will be selected and randomly assigned to attend the motivation/goal setting educational group of the study and receive email/group progress reports or to the control. Qualified candidates will be solicited by email, posters, flyers, the Skywriter (general article), other appropriate base media (attachment #3), and personal contact, providing information to civilians on the opportunity to participate in this study. A registration site will be available to all civilian base personnel. Investigator contact information will be provided through these media as well with the registration site provided and interested civilians can sign up or request more information. The appropriate health risk factor form can be completed and returned via the registration site. Upon receipt of this form either in person or by email, the candidate will be contacted by the appropriate investigator, who will explain the study and extend an invitation to the candidate for participation. Participants will be randomly assigned to the education or control group. Behavior/motivation of all participants will be assessed utilizing standard forms (attachment # 8) as well as a demographics survey (attachment #7) which will be included in the statistical analyses. As these questionnaires are completed, responses may generate uncomfortable feelings (sadness, anxiety or worry) or thoughts of which the participant was previously unaware. Should these concerns be generated, participants will be encouraged to speak with one of the investigators who will assist in the process of obtaining counseling through the Employee Assistance Program (EAP) or health benefits plan. These forms may also be administered at the end of a required class (standard nutrition or standard exercise), midpoint and end of the study for assessment. The ICD and medical history questionnaire (attachments #5 and #6) will be completed upon initial meeting with the appropriate investigators. Measurements will include body fat analysis (IronMan scale, BOD POD optional), height, weight, RMR, BMI, AB, IC, HR, BP, BT, S, F, BF, blood lipid profiles (HDL, LDL, total cholesterol, TG), blood levels of A1C, cortisol and homocysteine, and sit ups performed for one minute to determine abdominal strength. Blood samples will be collected via venipuncture.

**2. PERSONNEL DATA**:

Principal Investigator(s):

| Name | Rank | Date of Investigator Training | Staff Resident Fellow Civilian | Department/ Office Symbol | Phone | Pager | E-mail (if other than Outlook) |
|---|---|---|---|---|---|---|---|
| James F. Schlub | YD2 | 10/ 08 | CIV | 88AMDS/SGPZ | 904-9356 | | |

Associate Investigator(s):

| Name | Rank | Date of Investigator Training | Staff Resident Fellow Civilian | Department/ Office Symbol | Phone | Pager |
|---|---|---|---|---|---|---|
| Brenda E. Moore | Ph.D. | 10/08 | CTR | 88AMDS/SGPZ | 904-9362 | |
| Michael A. Papio | YH 601 02 | 10/08 | CIV | 88AMDS/SGPZ | 904-9361 | |
| Jon R. Jacobson | Major | 10/08 | Staff/DO | 88AMDS/SGPO | 904-8398 | |
| John J. Elshaw | LtCol | 8/09 | Staff/Ph.D . | AFIT/ENV | 255-3636 | |

Medical Facility Commander:

| Name | Rank | Department/Office Symbol | Phone | E-mail (if other than Outlook) |
|---|---|---|---|---|
| Kimberly Slawinski | Col | 88 MDG/CC | 7-8762 | |

**4. FACILITY:**

Health and Wellness Center at WPAFB, OH
88 AMDS/SGPZ
2690 C St. Bldg 571
WPAFB OH 45433

**5. CATEGORY OF STUDY:** Prevention (Screening for health risks factors)

**6. MEDICAL RESEARCH AREA:** Wellness

**7. ICD LOCATION:** HAWC and Occupational Medicine

## 8. RESEARCH PLAN:

### 8.1. Hypotheses or Research Questions or Objectives:

The addition of behavioral change support (education) increases participation of healthy lifestyle changes, in addition to participation in nutrition and fitness classes, resulting in the quantifiable improvement of measured health risk factors.

The purpose of this study is to determine if education in motivation/goal setting as well as on going support for behavioral change results in decreased morbidity /mortality risks compared to persons with the same program opportunities but without this education/support. Evaluation criteria are based on blood values for A1C, CRP, CBC with diff., glucose, cortisol, lipids, and homocysteine, as well as anthropometric measurements of body temperature, arm strength, flexibility, heart rate, blood pressure, inter-iliac crest, body mass index, abdominal strength, body fat, abdominal circumference and height, and resting metabolic rate measurement, taken at the beginning and ending of the program. Participants must have two or more of the following risks to be considered for participation in this study: blood pressure>140/90; total cholesterol>240; body mass index>30; fasting blood glucose>140; waist>40 inches for men or waist>35 inches for women.

**Hypothesis:** Supporting behavioral change through motivation and goal setting has a positive effect on lifestyle changes among participants, as measured by improvements in the listed parameters.

While excellent programs are offered to all personnel on the base for participation in classes and fitness programs, participation and utilization are less than stellar. It is thought that by offering behavioral support for change, participation and completion of programs will increase and quantifiable health risks may show improvement.

**Null hypothesis**: No correlations exist between motivation/goal setting education and support on health risks as measured by AC, AS, AH, BMI,IC, W, BMI, BT, S, F, BF and blood measurements of A1C, CRP, G,C, lipids, CBC with diff., and HC.

**Statistics**: Correlations among variables, standard deviation, variance analyses, confidence intervals, linear regression, prediction equations. Alpha = 0.05, $95^{th}$ percentile, n= 100

Previous studies indicate strong relationships among the various parameters listed above.

**Study Design**: Civilian personnel who have at least two known health risk factors (blood pressure>140/90; total cholesterol>240; body mass index>30; fasting blood glucose>140; waist>40 inches for men or waist>35 inches for women); smoking; aerobic exercise lee than twice a week; and who may be at risk for increased morbidity /mortality as measured by the above parameters will be selected for participation. Participants will be randomly assigned to one of two groups, either with motivation/goal setting (education group) or without it. All other education and fitness participation will be the same for both groups. Number and types of classes attended will be tracked by class rosters, and individual exercise/nutrition monitoring will be tracked by the individual based on the honor system. Motivation/behavior factors will be assessed for all participants utilizing standard evaluation forms attached). Measurements will include body fat analysis (IronMan Inner Scale with a BOD POD measurement optional), strength, flexibility and $VO_2$ sub-max (MicroFit Analysis System), height, weight, AC (tape measure), AH (calipers), IC (calipers), heart rate (HR), blood pressure (BP), blood lipid profiles (HD, LD, total cholesterol, TG), blood levels of A1C, cortisol (C) and homocysteine, HgbA1C, blood glucose, CBC with differentiation, abdominal strength (maximum number of sit ups which can be performed in one minute), and resting metabolic rate (MedGem). Blood samples will be collected via venipuncture.

**8.2. Significance:**

Several published studies indicate that there are strong relationships for reducing health risks by making positive lifestyle changes. However, these relationships have never been studied as they apply to the civilian population at WPAFB. In addition, the possible benefits of these studies will become more transparent as the number and types of measurements utilized to measure change improve. These new measurements include the addition of the IC, the combination of BF and RMR, AS, HC and CBC with diff., and will include the more common measurements such as blood lipids, glucose, etc. as listed above. This study will be expanded to include these parameters to better quantify health risks and to assess the effectiveness of intervention to cultural change and civilian health.

Results of this study will help improve the delivery and effectiveness of civilian Health Promotion programming at WPAFB. It may also help decrease morbidity/mortality risks for civilian personnel by fostering beneficial lifestyle change. In addition, it is hoped that analyses of these data will provide clues to the best methods for supporting a healthy lifestyle among base civilians.

**8.3. Military Relevance**:

Improving the health of the civilian workforce may have military relevance in two primary areas – increased health/fitness leading to increased productivity while performing their AF mission and reduced sick days - both of which reduce costs. These data will also be utilized to improve the ability of HAWC personnel to foster change among AD to support weight loss (Body Composition Improvement Program) and fitness efforts (Healthy Living Program) in order to meet AF PT requirements. By improving participation and utilization in nutrition and fitness programs among civilians, the Air Force mission of Fit to Fight is also optimized.

**Background and Literature Review**

The major push towards improving the health of the civilian population at Wright Patterson AFB began with the start up of the AF's first Health and Wellness Centers in 1987 under the direction of Jean Herbst BSN (Health Promotion Director) and then Col. Charles "Chip" Roadman. Col Roadman over the next decade was promoted to AF Lt Gen Roadman and served as the AF Surgeon General. During his tenure, HAWCs were brought on board at all major AF bases.

HAWC personnel and "wellness" representatives across each base became part of the base wide Health Promotion Working Group (HPWG), chaired by the base wing commander. The primary mission of the HAWC and HPWG was to improve health of our base community through programs on exercise, nutrition, stress reduction and tobacco cessation. Smoking cessation classes (taught by the HAWC director or volunteers) and Health Risks appraisals developed by the Carter Center and blood screenings taken at the unit (by the single HAWC med tech) were hallmarks of the program. Later HAWC personnel would tabulate results and brief members on health risks as unit commander on overall stats and changes from previous visits. However, year to year individual changes were not as effectively monitored. Over the ensuing years, the HAWC staff grew to include a dietitian, an exercise physiologist and, periodically, a health educator, and the variety of programs increased. A study of HAWC programming on base was published in 1995 in the American Journal of Health Promotion and in the medical service digest (1,2). Several physiological as well as psychological/behavioral improvements were noted and were positively related to program involvement. Other organizations/companies have found similar outstanding results for their Health promotion programming (3,4). These studies also demonstrated a reduction in health care costs and a variety of markers for health risks, with promotion of healthy behaviors that improve risk factors such as lipid profile, stress levels, overweight, A1C, glucose levels, blood pressure, integrated risk score and increased exercise frequency.

During the late 1990's, base wellness programs were becoming more diverse while at the same time the HAWC involvement in the military fitness and weight management program was expanded. Soon, the HAWC was in charge of all training, rehab education and program management, with expanded roles in medical profiles for the fitness program. This added commitment and civilian interest without added personnel and impacted the HAWC's ability to continue servicing all the base community to the extent it once did or meet the increased demand for new services.

In December 2004 under the direction of AFMC General Gregory "Speedy" Martin the Civilian Health Promotion Services (CHPS) program (under the auspices of the Federal Occupational Health division under the Department of Health and Human Services) came on board for all AFMC bases. This program funded approximately 4 contract slots on each base to direct health promotion programs solely to the non-military population. Since their inception, the HAWC, CHPS, Services and other base organizations have worked together to address the needs of our civilian population. Many health/fitness promotion efforts have been spearheaded by these groups, in addition to other organizations on base, with varying amounts of success for decreasing health risk and increasing healthy behaviors. Health promotion improvement incentive programs such as the "500 Club" (1992-1999), 2000-2003 "A Fitness Odyssey", Winter Exercise Challenge (02-03), the Team Lean Challenge (07-09), the Wellness Cup (1999-2004), Portion Off the Pounds (05-08), 10,000 Steps Program (07 -,09), Get Moving (09), President's Challenge (08) and the AFMC wellness website itself (05-09) are just a few of the programs/websites initiated on the base to increase exercise/health behaviors. However, even with a good working relationship, there was overlap of programming and sometimes a lack of targeted education where it was needed, or lackluster participation. Therefore, a renewed push was started to get civilian wellness programs charged up. In 2008 the wing appointed a director of the Installation Civilian Wellness Program at WPAFB to spearhead increased collaboration, marketing and programming for civilian wellness programs on base.

CHPS has had an aggressive screening and education program providing health risk information to individuals either at the HAWC or in briefings at different worksites. For example, if it is found that a unit has 40% smokers or high numbers of individuals with elevated blood pressure, it will be suggested to the unit to schedule smoking cessation or blood pressure control classes. However, follow-up longitudinal statistics on the effect of programming on these data have been unavailable either on the individual or unit basis. In other words, we are presently not effectively tracking the results of these programs (either for the initial screening or later added classes, etc.) on changes in health risk. Results thus far have been tabulated primarily on participation and disease prevalence rates but not for change over time.

This study is an attempt to quantify the effects of a 16 week wellness program with interventions/classes on a group of 100 civilian employees. Anthropomorphic and physiological measurements will be determined pre and post and comparisons made as well as correlations on the number and type of wellness interventions offered and health/behavior improvements. One important additional variable will be ascertained that was not in previous base studies: waist measurement which has been found to have a high correlation with cardiovascular mortality, and the risk of metabolic syndrome, both more so than BMI or weight alone (5,6,7,8,9). In addition, markers of inflammation (which have been shown to have a large role in risk of cardiovascular disease) such as C reactive protein will also be analyzed in this study (6). Lastly, sit up performance to evaluate abdominal strength will be determined. Poor performance for sit ups has also been highly correlation to increase risk of cardiovascular disease mortality (10). New parameters for evaluation criteria also include CBC with diff., HgbA1C, and HC.

The AF has recognized the importance of behavior change education in its fitness program (behavior change is a large mandatory component of its Healthy Living Program class for military members who fail their fitness tests). Yet in other health settings we often talk what we "need to do" but not "how we get ourselves to do it." In previous base programs or studies - although behavior change was included in varying degrees in most education class - it was not given primary status on its own so it's effect and/or importance could not be quantified. The primary objective of the present study is to correct for this problem. A major stand alone education focus of this study will be education on motivation and goal setting to promote beneficial behavior change. Therefore, two main treatment groups will be randomly selected with the only difference being exposure in one group to initial and monthly motivation/ behavioral change focused education.

This study will also serve as a valuable tool to determine which programs are effective on what health risk. Presently the HAWC receives data on a "needs assessment" tool biannually. Respondents reply on what classes they would like to see offered – this gives a measure of interest- but this study would give an even more important measure of effectiveness. Our role then post study is not only to improve program effectiveness but also to increase interest for civilians to participate in programs which are the most effective for their individual health risk. Effective programs/behaviors that people will enjoy and take part in for a lifetime is where we will achieve the most bang for our wellness buck.

### 8.5. Research Design and Methods:

**Materials and Methods:**

Approximately 100 individuals from the DoD civilian population (ages 18-65 years) employed at WPAFB will be recruited. Marketing for this study will be accomplished by personal contact, base emails, newspaper, brochures, pamphlets, flyers, and posters. Contact information will be provided within all marketing materials and volunteers will be able to express interest in participating by email, phone or personal contact with investigators. An assessment sheet attached) will be provided to volunteers who will be asked to respond to the presence or absence of risk factor criteria. Participants must be able to participate in physical activity and have the required form for three hours of leave completed and signed by their physician prior to starting the program. Qualifying participants will meet personally with one of the investigators who will describe and discuss all of the procedures, risks, and benefits which will also be detailed on a statement of informed consent which the participant will sign. Participants will be allowed to leave the study at anytime without constraint. Participants will be asked to follow pre-testing guidelines which include a 3 hour fast with no exercise, tobacco or caffeine during this time. Upon meeting the criteria for participation, volunteers will be asked to meet with the PI and another investigator for explanation of the study and to complete the ICD the medical history questionnaire (while these responses will be recorded, the specific medication(s) will not be recorded). These forms will be kept in a locked metal cabinet in the HAWC. Upon completion, participants will make an appointment to complete the non-invasive pre-screening requirements listed above. Blood work will be ordered by Dr. Jacobson. Participants will be asked to fast overnight (12 hours) and report to the Medical Center for the blood draw. All data will be received and evaluated by the physician, data recorded and tabulated by the appropriate investigator for statistical analyses. To ensure privacy of data, all data will be coded and only the appropriate investigator will have access/knowledge of that code.

The following non-invasive procedures will be performed in the following sequence, with individuals' initials:

Oral temperature, heart rate and blood pressure (Welch Allyn machine): BEM
Height (ACCUSTAT Genetech Stadiometer): BEM
Resting metabolic rate (MedGem): BEM
Waist measurement (tape measure, average of three measurements): MAP
IC width (ANTHROPOMETER calipers, average of three measurements): MAP
Weight (BOD POD digital scale): MAP
Body fat analysis (Ironman Inner Scale; BOD POD optional): MAP
BMI (calculation): MAP
$VO_2$ sub-max (MicroFit Analysis System): MAP
Arm strength (Microflex): BEM/MAP
Flexibility (MicroFit Analysis System): BEM/MAP
Sit ups (exercise mat): JFS
Statistical Analyses: BEM with JH

The time sequence of testing will be as follows:

Start time 0 min – Anthropometric/performance testing is completed at the HAWC

0 - 10 min – Subject arrives and change clothes to testing attire if needed. At this time investigators will give a short outline of the tests they will conduct that day while the subject sits at rest.

10 - 25 min – A resting blood pressure (sit for at least 5 minutes), HR and oral temp will be taken. Subject will be instructed for MedGem testing. Member will be informed of the time duration for the test and proper test procedures – i.e. sitting quietly, place the nose clip on the client's nose, give the client the MedGem device and have him position the mouthpiece comfortably in his mouth, ensuring a tight seal. Have the client breath normally into the device. The measurement will take about 5 - 10 minutes.

25 - 35 min – Waist and IC width determined in triplicate by tape measure (waist) at the level of the naval and graduated anthropometer (iliac crest width) marking the top of the iliac crest on the side of the body. Tape will be pulled tight to the body after a normal exhalation making sure it is level to the floor but not indenting skin. Waist tape readings will be rounded down to the nearest ½ inch and measures repeated until three measures agree within the ½ inch criteria. Hip crest widths will be measured in cm rounded off to the nearest 0.5 cm and replicated until three measures agree within the 0.5 cm criteria. These data will be converted to inches.

35 - 50 min Weight and body fat will be assessed by utilizing the IronMan (Inner Scan) scale. IronMan Scale (Inner Scan body composition monitor, weight and body fat) procedure:
To ensure accuracy, readings must be taken without shoes and socks and under consistent conditions of hydration. The participant will be given an IronMan Scale pre-sheet (see attachment #3). Heels should be correctly aligned with the electrodes on the measuring platform. This procedure will take approximately 5 minutes. BOD POD testing will be optional but not required. Subject will be instructed for BOD POD testing if desired. BOD POD: Participant will be informed of the time duration for the test and proper test procedures – i.e. sitting quietly, hands on lap, legs not crossed and breathing normally throughout the test. Participants will also be shown the BOD POD release button which they can press to open for any reason. Each test consists of two actual test periods and will take approximately 5 to 10 minutes depending on the repeat test reliability requirements. The system will repeat the test if test repeatability is below test system requirements. Test data will be recorded on a test data sheet as well as stored in the BOD POD computer database.

50 - 55 min – IronMan/BOD POD testing is completed and participant is now given instructions for the sit up test. Testing method differs slightly from AF testing in that the hands are held behind the head and fingers laced during the entire time of testing. Participant lies on padded surface on a sit up board with feet anchored under a roll pad. Knees and hips will be at 45 degree angles. A full sit-up will be counted when the body rises high enough for the elbows touch the knees and return to the floor/pad until the shoulders touch. Maximal number of reps performed properly in one minute will be counted and recorded on a test data sheet.

55 - 75 min - MicroFit Health and Fitness Analysis System procedure:
The MicroFit will provide the participant with a fitness assessment of their arm strength, back flexibility and cardiovascular fitness. First, the participant will be required to ride an Ergometry bike for approximately 8 to 12 minutes, this will provide a $VO_2$ sub-maximal aerobic fitness score. Secondly, they will stand on a platform which has an attached arm bar, and will pull the bar (one time) at maximal strength for about 10-20 seconds, this will provide a one max rep score. Finally, they will sit on the floor and perform a reach test - three times and the best score will be recorded, this will provide a flexibility score. There is a minimal risk of injury; please stop exertion if pain or discomfort is experienced during any part of the assessment.

75 min – Participant is then directed to the Medical Center for the blood draw. Blood samples will be taken during that same week if possible, adhering to the 12 hour fasting guidelines. The sample will then be handled, prepared, treated and stored according to standard procedure and transported to the WP medical center lab for analysis.

Blood will be collected according to standard WPAFB 88 MDG (Medical Center) Lab protocol in the WPAFB Medical Center. Approximately a 20 cc blood sample will be collected.

All procedures performed that have been described are within 88 MDG standard care protocol. Statistical Analyses: All statistics will be conducted by primary and associate investigators with consultation from Joseph Huelsman GS-11, AFMC/A49, phone 257-4239 who has underwent investigator training Oct 08. To ensure privacy of data, all data will be coded and only the appropriate investigator will have access/knowledge of that code. Mr Huelsman will work with coded data only and will have no access/knowledge of the subject code.

**Statistics**: Correlations among variables, standard deviation, variance analyses, linear regression, prediction equations. P=0.05, 95$^{th}$ percentile, n=100 to 150

"All specimens kept at 88 MDG laboratories and will be handled and disposed of in accordance with federal regulations."

**8.6. Source of Research Material per Participant**:

| Source of Research Material per Participant | Standard Care | Research Driven |
|---|---|---|
| Blood Sample - Lipid profile | 0 | 2 |
| Blood Sample - HgbA1C, glucose | 0 | 2 |
| Blood Sample- Homocysteine | 0 | 2 |
| HAWC Record Data | 0 | 2 |
| Blood Sample - CBC with diff | 0 | 2 |
| Blood Sample - Cortisol | | |
| Blood Sample - CRP | 0 | 2 |

### 8.7. Inclusion/exclusion criteria:

The target population is DoD Civilians 18-65 years of age and employed at WPAFB. Participants must have two or more of the following risks to be considered for participation in this study: blood pressure>140/90; total cholesterol>240; body mass index>30; fasting blood glucose>140; waist>40 inches for men or waist>35 inches for women; aerobic exercise less than twice a week; smoking. Participants will be asked whether they are currently taking medications for hypertension, cholesterol or diabetes. If the answer is affirmative, which condition(s) will be noted but no specific medication list will be required. Participants must be able to participate in physical activity and have the required form for three hours of leave completed and signed by their physician prior to starting the program.

There are no exclusion criteria with the exception of the lack of parameters listed in the previous paragraph.

### 8.8. Number of Subjects:

TOTAL NUMBER OF SUBJECTS (study-wide): 100 Civilians from WPAFB

## 9. HUMAN SUBJECT PROTECTION

### 9.1. Recruitment:

Volunteers will be recruited from the DoD civilian population on WPAFB who meet at least two of the health risk parameters and are cleared by their physician to participate in physical activity. Presence of these parameters will be obtained through the attached form. Solicitation for participation in this opportunity will be by email, personal contact, base newspaper, flyers, posters and other base media. An ICD and a family history questionnaire will be provided at the initial study information meeting (PI with another investigator).

Subjects will not be paid for participation in this study.

### 9.2. Benefits:

Subjects will receive information regarding their body fat, blood profiles, and health risk factors. It may promote the subject's involvement in self-care, disease prevention and possibly support beneficial lifestyle changes.

### 9.3. Risks:

There is only one possible risk associated with the non-invasive measurements used in this study and that is subjects may experience some claustrophobic feelings while in the BOD POD (optional). Body fat analysis will be assessed utilizing the IronMan (Inner Scale). For the invasive techniques there are some minimal risks associated by drawing blood which include: bruising (hematoma), soreness and excessive oozing at the site of the venipuncture. Additional risks outside test administration itself include the identification of new diseases and any possible personal or civilian ramifications from the discovery of the disease.

**9.4. Safeguards for Protecting Subjects:**

All records will be kept confidential, in a locked metal filing cabinet in the Health and Wellness Center. All subject data will be assigned a number for identification purposes and statistical analyses. The identification key will be known to only one investigator. Lab results will be only viewed by appropriate investigators. Results will be communicated to the subject, and kept in the individual's HAWC record. These data, received by the investigators, will be converted from names to assigned numbers for statistical purposes. Note: any and all statistical assistance from Mr. Huelsman will be on coded information with no knowledge of code. All ICD will also be kept in the subject's HAWC record along with the additional non-invasive procedures data. All subjects will be treated in compliance with AFI 40-402 and applicable FDA and HHS guidelines.

**9.5. Alternatives**: The only alternative will be not to participate in the study. However, members will still be offered standard HAWC, CHPS and Services education, training and fitness/nutrition programs.

**10. DATA ANALYSIS**:

Outcome measures will be determined by statistical analyses only.

**11. SAMPLE SIZE ESTIMATION/POWER ANALYSIS:**

100 volunteers will be recruited to participate in this study. Statistical analyses will be performed with n-1 degrees of freedom, and the 95$^{th}$ percentile, alpha = 0.05.

**12. DURATION OF STUDY:**

Approximate duration of the study: 4 months

**13. USE OF INVESTIGATIONAL DRUG: N/A**

**14. USE OF INVESTIGATIONAL DEVICE: N/A**

**15. LOCAL SUPPORT SERVICES REQUIRED (Lab Support, Stats Support, AFIT):**

**15.1. Lab Support:**

| Description or Test Name | Research Driven | Which lab will perform each test? |
|---|---|---|
| Blood lipids | Yes | WPMC |
| Blood glucose | Yes | WPMC |
| Blood homocysteine | Yes | WPMC |
| Hemoglobin A1C | Yes | WPMC |
| CBC with diff. | Yes | WPMC |
| C Reactive Protein | Yes | WPMC |
| Cortisol | Yes | WPMC |

**15.2. Radiology Support Required**: N/A

**15.3. Pharmacy Support**: N/A

**15.4. Nursing Support**: N/A

**15.5. Radioactive Materials:** N/A

**15.6. Other Local Support**: N/A

**16. COLLABORATING INSTITUTION SUPPORT:** Air Force Institute of Technology

**17. BUDGET:** MedGem: $3,000.00
Refill for MedGem, P/N 609-0075-01 D: $3,300.00
Blood work cost: $14,500.00

This protocol has kindly been funded by the 88 Air Base Wing and the Installation Civilian Wellness Program.

**18. EXTERNAL RESOURCES:** N/A

**19. MANPOWER:** (hours per completed study, including publications preparation, etc.)
Principle Investigator, J.F. Schlub: 250 hours, on duty
Associate Investigator, B.E. Moore: 50 hours, on duty
Associate Investigator, J.J. Elshaw: 75 hours, on duty
Associate Investigator, M.A. Papio: 150 hours, on duty
Associate Investigator, J.R. Jacobson: 60 hours, on duty

## 20. BIBLIOGRAPHY


1. "A Study of a USAF Wellness Program" J. Schlub, D. Herbst, L. Seas, P.Jenks, C. Lamoreaux, F. Kelly, L. Guttersohn. USAF Med. Digest, Fall, 1994.

2. "DOD Health and Wellness Center: Wellness Makes Impact" J. Schlub, D. Herbst, L. Seas, P. Jenks, C. Lamoreaux, F. Kelly, L. Guttersohn. AJHP, May/Jun Vol.9, No. 5, 1995.

3. Cianbro Develops World Class Wellness Initiative – Wellness Councils of America, 2006 http://www.welcoa.org/wellworkplace/index.php?category=20

4. International: A Platinum Well Workplace Case Study – Wellness Councils of America, 2006 http://www.welcoa.org/wellworkplace/index.php?category=20

5. Janssen, L. et al., Waist circumference not body mass index explains obesity related Health Risk. Am. J. Clin. Nutrition., 79(3): 379-384, 2004.

6. Klein, S et al. Waist Circumference and Cardiometabolic Risk: A consensus statement from Shaping America's Health: Association for Weight management and Obesity Prevention:NAASO, The Obesity Society; The American Society for Nutrition and the American Diabetes Association, Diabetes Care, 30: 1657-1692, 2007.

7. Koster, K. et. al., Waist Circumference and Mortality. Am. J. Epidemiology., 167(12): 1465-1475, 2008.

8. Lakka, T et. al., Abdominal obesity is associated with accelerated progression of carotid atherosclerosis in men. Atherosclerosis, 154(2): 497-504, 2001.

9. Chan , D. et al Waist circumference, waist-to-hip ratio and body mass index as predictors of adipose tissue compartments in men. QJM 96(6):441-447, 2003.

10 . Katzmarzyk, P and Craig C. Musculoskeletal fitness and risk of mortality. Med. Sci. Sports Exerc., Vol 34 (5), pp 740-744, 2002.


**21. RISK CATEGORY:** Minimal

## 22. SIGNATURE SECTION

**Principal Investigator:** I am aware that I am not authorized to accept any funds or other form of compensation for conducting research. All subjects will be treated in compliance with all applicable organizational, service, DoD and Federal regulations, and all applicable FDA and HHS guidelines. I have read, understand, and signed the attached Certificate of Compliance. I understand I must complete a review of this protocol at least every 12 months to prevent expiration of the study's approval. I will notify the protocol office **prior** to PCS/separations actions, or closure.

| | |
|---|---|
| James F Schlub, YD-2, Civilian<br>Exercise Physiologist | Date |

---

**Flight Commander:** I have considered this protocol and the personnel and resource support involved. I find this protocol to have sufficient scientific merit for consideration by the Squadron Commander and Institutional Review Board.

| | |
|---|---|
| Theresa Siejack, YJ-2, USAF, Civilian<br>Health Promotion Manager | Date |

---

**Squadron Commander:** I have considered this protocol and am able to approve Squadron personnel and resource support. I understand that I will be the point of contact for correction of deficiencies should the principal investigator fail to meet the requirements agreed to in the Certificate of Compliance completed by the PI. I find this protocol to have sufficient scientific merit for consideration by the Institutional Review Board.

| | |
|---|---|
| Dawn E. Wilson, Col, USAF, BSC<br>Commander, 88 AMDS | Date |

# Appendix B

## Results of Analysis of Variance

**ANOVA**

Motivation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | .653 | 1 | .653 | 3.109 | .081 |
| Within Groups | 23.109 | 110 | .210 | | |
| Total | 23.763 | 111 | | | |

**ANOVA**

EmoExhaust

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 2.952 | 1 | 2.952 | 1.787 | .184 |
| Within Groups | 181.770 | 110 | 1.652 | | |
| Total | 184.722 | 111 | | | |

**ANOVA**

T1-BMI

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 33.279 | 1 | 33.279 | .722 | .397 |
| Within Groups | 5113.117 | 111 | 46.064 | | |
| Total | 5146.396 | 112 | | | |

**ANOVA**

T1-LAB LDL

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 443.310 | 1 | 443.310 | .376 | .541 |
| Within Groups | 127340.046 | 108 | 1179.074 | | |
| Total | 127783.356 | 109 | | | |

## Appendix C

### Behavioral & Demographic Survey:

### Motivation Questions (1-9)/Emotional Exhaustion Questions (46-54)

Read each statement and using the scale below as a reference, circle the number rating from 1 "Strongly Disagree" to 7 "Strongly Agree" which indicates how you feel.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Strongly Disagree | Disagree | Slightly Disagree | Neither Agree nor Disagree | Slightly Agree | Agree | Strongly Agree |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. Doing well in this program is important to me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. I want to do well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. I will try my best in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. I will try to do the very best I can while in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. While participating in this program, I will work hard and try to do well. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. I want to be among the top performers in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. I am extremely motivated to do well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. I just don't care how I do in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. I won't put much effort into this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. I would like to do well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. It would be good to succeed while in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. I want to succeed while in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. If you do well in this program, you have a good chance of increasing your health. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. I think you will improve your health if you succeed in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15. How well you do in this program will affect your overall health. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16. The better you do in this program, the better your chance of increasing your health. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 17. If you try to do your best in this program, you can get a significant result. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18. If you try hard you can make significant results in increasing your health. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19. You can improve your health in this program if you put some effort into it. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20. I will be able to achieve most of the goals that I have set for myself. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21. When facing difficult tasks, I am certain that I will accomplish them. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22. In general, I think that I can obtain outcomes that are important to me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23. I believe I can succeed at most any endeavor to which I set my mind. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24. I will be able to successfully overcome many challenges. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25. I am confident that I can perform effectively on many different tasks. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 26. Compared to other people, I can do most tasks very well. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 27. Even when things are tough, I can perform quite well. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28. Performing well in this program is very important to me | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29. Performing well in this program is personally meaningful to me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 30. Success in this program is meaningful to me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 31. I am confident about my ability to perform well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 32. I am self-assured about my capabilities to perform well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 33. I have mastered the skills necessary to perform well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 34. I have significant autonomy in determining how I perform in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 35. I can decide on my own how to go about obtaining results in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 36. I have considerable opportunity for independence and freedom in how I perform in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 37. My impact on what happens in my life is large. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 38. I have a great deal of control over what happens in my life. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 39. I have significant influence over what happens in my life. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 40. My opinion of myself goes up when I perform well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 41. I feel a great sense of personal satisfaction when I perform well in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 42. I feel bad and unhappy when I discover that I have performed poorly in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 43. My own feelings generally are not affected much one way or the other by how well I do in this program. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 44. Most people in this program feel a great sense of personal satisfaction when they do well. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 45. Most people in this program feel bad or unhappy when they find that they have performed poorly. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 46. Working with people all day is a strain for me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 47. I feel burned-out from my work. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 48. I feel frustrated by my job. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 49. I feel I'm working too hard on my job. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 50. Working with people directly puts too much stress on me. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 51. I feel like I'm at the end of my rope. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 52. I feel emotionally drained from my work. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 53. I feel used up at the end of the day. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 54. I feel fatigued when I get up in the morning and have to face another day on the job. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 55. I feel that I am a person of worth, at least on an equal basis with others. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 56. I feel that I have a number of good qualities. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 57. All in all, I am inclined to feel that I am a failure. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 58. I am able to do things as well as most other people. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 59. I feel that I do not have much to be proud of. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 60. I take a positive attitude toward myself. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 61. On the whole, I am satisfied with myself. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 62. I wish I could have more respect for myself. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 63. I certainly feel useless at times. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 64. At times I think I am no good at all. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 65. Whether or not I get to be a leader depends mostly on my ability. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 66. When I make plans, I am almost certain to make them work. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 67. When I get what I want, it's usually because I'm lucky. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 68. I have often found that what is going to happen will happen. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 69. I can pretty much determine what will happen in my life. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 70. I am usually able to protect my personal interests. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 71. When I get what I want, it's usually because I worked hard for it. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 72. My life is determined by my own actions. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 73. Whether or not I get to be a leader depends mostly on my ability. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 74. My feelings are easily hurt. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 75. I'm a nervous person. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 76. I'm a worrier. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 77. I am often tense or "high strung." | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 78. I often suffer from "nerves." | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 79. I am often troubled by feelings of guilt. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 80. My mood often goes up and down. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 81. Sometimes I feel miserable for no reason. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 82. I am an irritable person. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 83. I often feel fed up. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 84. I often worry too long after an embarrassing experience. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 85. I often feel lonely. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | Very slightly or not at all | A Little | Moderately | Quite a Bit | Extremely |

Rate the following items as to what extent you generally feel this way, that is, how you feel on average

| | | | | | |
|---|---|---|---|---|---|
| 86. Interested | 1 | 2 | 3 | 4 | 5 |
| 87. Distressed | 1 | 2 | 3 | 4 | 5 |
| 88. Excited | 1 | 2 | 3 | 4 | 5 |
| 89. Upset | 1 | 2 | 3 | 4 | 5 |
| 90. Strong | 1 | 2 | 3 | 4 | 5 |
| 91. Guilty | 1 | 2 | 3 | 4 | 5 |
| 92. Hostile | 1 | 2 | 3 | 4 | 5 |
| 93. Enthusiastic | 1 | 2 | 3 | 4 | 5 |
| 94. Proud | 1 | 2 | 3 | 4 | 5 |
| 95. Irritable | 1 | 2 | 3 | 4 | 5 |
| 96. Alert | 1 | 2 | 3 | 4 | 5 |
| 97. Ashamed | 1 | 2 | 3 | 4 | 5 |
| 98. Inspired | 1 | 2 | 3 | 4 | 5 |
| 100. Nervous | 1 | 2 | 3 | 4 | 5 |
| 101. Determined | 1 | 2 | 3 | 4 | 5 |
| 102. Attentive | 1 | 2 | 3 | 4 | 5 |
| 103. Jittery | 1 | 2 | 3 | 4 | 5 |
| 104. Active | 1 | 2 | 3 | 4 | 5 |
| 105. Afraid | 1 | 2 | 3 | 4 | 5 |

**Demographics Survey**

Please provide the following demographic information.

1. Gender:__________________________________________________________
2. Job type (e.g. Program Management, Contracting, Finance, Cost, Logistics, etc.):__

   ______________________________________________________________
3. Years of work experience:_____________________________________________
4. Highest level of education:___________________________________________
5. Organizational level of current position (e.g. HQ Staff, Functional Staff, Wing, Group, Squadron, Program level):____________________________________________________
6. Organization:_______________________________________________________
7. Do you use tobacco products? _______________ If yes, how often?____________
8. How often do you consume alcohol?______________________________________
9. How far do you need to travel to get to the gym where you typically work out?________

# Appendix D

## Results of Reliability Analysis

## Motivation at Time 1

**Reliability Statistics**

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .905 | .941 | 9 |

**Item-Total Statistics**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| mot1 | 53.0000 | 13.928 | .798 | .733 | .887 |
| mot2 | 52.9375 | 14.257 | .817 | .829 | .888 |
| mot3 | 52.9464 | 14.051 | .834 | .866 | .886 |
| mot4 | 52.9286 | 13.869 | .870 | .912 | .884 |
| mot5 | 52.9375 | 13.843 | .869 | .937 | .884 |
| mot6 | 53.6250 | 12.345 | .465 | .261 | .948 |
| mot7 | 53.1607 | 13.542 | .714 | .550 | .892 |
| mot8r | 52.9196 | 14.435 | .710 | .848 | .894 |
| mot9r | 52.9018 | 14.504 | .740 | .876 | .893 |

## Motivation at Time 2

**Reliability Statistics**

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .945 | .956 | 9 |

**Item-Total Statistics**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| T2Q1 | 48.3871 | 44.831 | .877 | .923 | .937 |
| T2Q2 | 48.3387 | 45.769 | .819 | .897 | .940 |
| T2Q3 | 48.6129 | 42.995 | .884 | .884 | .934 |
| T2Q4 | 48.6774 | 41.566 | .911 | .917 | .932 |
| T2Q5 | 48.6935 | 42.347 | .867 | .877 | .934 |
| T2Q6 | 49.4032 | 38.638 | .708 | .680 | .953 |
| T2Q7 | 48.9032 | 40.679 | .872 | .856 | .934 |
| T2Q8r | 48.3548 | 44.790 | .692 | .816 | .943 |
| T2Q9r | 48.4355 | 43.889 | .721 | .849 | .942 |

## Emotional Exhaustion at Time 1

**Reliability Statistics**

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .923 | .926 | 9 |

**Item-Total Statistics**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| EE1 | 21.49 | 111.658 | .597 | .671 | .922 |
| EE2 | 21.11 | 100.547 | .854 | .789 | .905 |
| EE3 | 21.17 | 105.638 | .726 | .684 | .914 |
| EE4 | 21.28 | 106.670 | .728 | .605 | .914 |
| EE5 | 21.97 | 112.945 | .757 | .748 | .914 |
| EE6 | 22.39 | 115.394 | .695 | .581 | .918 |
| EE7 | 21.72 | 103.103 | .820 | .738 | .908 |
| EE8 | 21.33 | 103.070 | .733 | .669 | .914 |
| EE9 | 21.46 | 108.737 | .666 | .517 | .918 |

## Emotional Exhaustion at Time 2

**Reliability Statistics**

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .920 | .922 | 9 |

**Item-Total Statistics**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| T2Q46 | 22.52 | 107.963 | .589 | .680 | .919 |
| T2Q47 | 22.25 | 99.580 | .797 | .739 | .905 |
| T2Q48 | 22.11 | 98.810 | .817 | .839 | .903 |
| T2Q49 | 22.37 | 102.881 | .733 | .604 | .909 |
| T2Q50 | 23.06 | 112.738 | .629 | .685 | .916 |
| T2Q51 | 23.56 | 112.864 | .718 | .691 | .913 |
| T2Q52 | 22.78 | 100.627 | .828 | .832 | .902 |
| T2Q53 | 22.44 | 102.477 | .696 | .704 | .912 |
| T2Q54 | 22.59 | 105.956 | .679 | .655 | .913 |

# Appendix E

## Results of Factor Analysis

### Time 1

KMO and Bartlett's Test

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .850 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1910.311 |
| | df | 153 |
| | Sig. | .000 |

**Anti-image Matrices**

| | | mot1 | mot2 | mot3 | mot4 | mot5 | mot6 |
|---|---|---|---|---|---|---|---|
| Anti-image Covariance | mot1 | .232 | -.071 | .014 | -.031 | -.005 | -.037 |
| | mot2 | -.071 | .166 | -.054 | .012 | -.024 | .014 |
| | mot3 | .014 | -.054 | .124 | -.018 | -.029 | -.016 |
| | mot4 | -.031 | .012 | -.018 | .085 | -.042 | .019 |
| | mot5 | -.005 | -.024 | -.029 | -.042 | .056 | -.024 |
| | mot6 | -.037 | .014 | -.016 | .019 | -.024 | .668 |
| | mot7 | -.053 | .010 | -.002 | -.007 | -.012 | -.021 |
| | mot8r | -.005 | -.043 | .007 | -.017 | .031 | -.065 |
| | mot9r | .007 | .038 | .003 | .010 | -.036 | .043 |
| | EE1 | -.059 | .009 | .014 | .015 | -.018 | .056 |
| | EE2 | .027 | -.017 | .014 | -.009 | -.001 | .020 |
| | EE3 | -.031 | .011 | .004 | .010 | -.006 | -.020 |
| | EE4 | -.010 | -.012 | -.006 | -.009 | .012 | .021 |
| | EE5 | .054 | .000 | -.006 | -.004 | .003 | -.042 |
| | EE6 | -.024 | .019 | .016 | -.003 | -.003 | -.057 |
| | EE7 | -.014 | -.007 | -.017 | -.007 | .015 | .004 |
| | EE8 | .045 | -.001 | .016 | .022 | -.031 | .080 |
| | EE9 | -.041 | .000 | -.005 | -.001 | .015 | -.054 |
| Anti-image Correlation | mot1 | .902[a] | -.360 | .081 | -.221 | -.047 | -.093 |
| | mot2 | -.360 | .885[a] | -.377 | .102 | -.245 | .041 |
| | mot3 | .081 | -.377 | .929[a] | -.171 | -.345 | -.055 |
| | mot4 | -.221 | .102 | -.171 | .896[a] | -.610 | .079 |
| | mot5 | -.047 | -.245 | -.345 | -.610 | .820[a] | -.123 |
| | mot6 | -.093 | .041 | -.055 | .079 | -.123 | .882[a] |
| | mot7 | -.179 | .040 | -.008 | -.039 | -.082 | -.041 |
| | mot8r | -.027 | -.295 | .059 | -.158 | .362 | -.222 |
| | mot9r | .043 | .285 | .023 | .102 | -.462 | .159 |
| | EE1 | -.229 | .043 | .076 | .096 | -.145 | .129 |
| | EE2 | .134 | -.098 | .092 | -.076 | -.012 | .058 |
| | EE3 | -.119 | .052 | .023 | .063 | -.046 | -.045 |
| | EE4 | -.034 | -.050 | -.028 | -.053 | .082 | .043 |
| | EE5 | .239 | .001 | -.038 | -.027 | .025 | -.108 |
| | EE6 | -.079 | .073 | .072 | -.016 | -.023 | -.109 |
| | EE7 | -.057 | -.033 | -.098 | -.052 | .130 | .009 |
| | EE8 | .176 | -.004 | .084 | .142 | -.246 | .182 |
| | EE9 | -.131 | .000 | -.021 | -.004 | .095 | -.102 |

a. Measures of Sampling Adequacy(MSA)

**Anti-image Matrices**

| | | mot7 | mot8r | mot9r | EE1 | EE2 | EE3 |
|---|---|---|---|---|---|---|---|
| Anti-image Covariance | mot1 | -.053 | -.005 | .007 | -.059 | .027 | -.031 |
| | mot2 | .010 | -.043 | .038 | .009 | -.017 | .011 |
| | mot3 | -.002 | .007 | .003 | .014 | .014 | .004 |
| | mot4 | -.007 | -.017 | .010 | .015 | -.009 | .010 |
| | mot5 | -.012 | .031 | -.036 | -.018 | -.001 | -.006 |
| | mot6 | -.021 | -.065 | .043 | .056 | .020 | -.020 |
| | mot7 | .380 | -.066 | .027 | .066 | -.022 | .046 |
| | mot8r | -.066 | .129 | -.100 | -.016 | .033 | -.029 |
| | mot9r | .027 | -.100 | .108 | .023 | -.035 | .031 |
| | EE1 | .066 | -.016 | .023 | .285 | -.073 | .026 |
| | EE2 | -.022 | .033 | -.035 | -.073 | .175 | -.131 |
| | EE3 | .046 | -.029 | .031 | .026 | -.131 | .284 |
| | EE4 | -.073 | .039 | -.028 | .037 | .008 | -.073 |
| | EE5 | -.007 | -.006 | .004 | -.162 | .000 | .004 |
| | EE6 | .002 | .005 | .004 | .084 | -.040 | .023 |
| | EE7 | -.008 | -.016 | .014 | .012 | -.037 | -.045 |
| | EE8 | .007 | -.035 | .025 | -.021 | -.021 | .066 |
| | EE9 | .085 | -.029 | .014 | .036 | -.057 | -.016 |
| Anti-image Correlation | mot1 | -.179 | -.027 | .043 | -.229 | .134 | -.119 |
| | mot2 | .040 | -.295 | .285 | .043 | -.098 | .052 |
| | mot3 | -.008 | .059 | .023 | .076 | .092 | .023 |
| | mot4 | -.039 | -.158 | .102 | .096 | -.076 | .063 |
| | mot5 | -.082 | .362 | -.462 | -.145 | -.012 | -.046 |
| | mot6 | -.041 | -.222 | .159 | .129 | .058 | -.045 |
| | mot7 | .916[a] | -.299 | .136 | .199 | -.085 | .139 |
| | mot8r | -.299 | .707[a] | -.851 | -.084 | .221 | -.149 |
| | mot9r | .136 | -.851 | .741[a] | .129 | -.254 | .175 |
| | EE1 | .199 | -.084 | .129 | .753[a] | -.328 | .090 |
| | EE2 | -.085 | .221 | -.254 | -.328 | .835[a] | -.585 |
| | EE3 | .139 | -.149 | .175 | .090 | -.585 | .832[a] |
| | EE4 | -.199 | .183 | -.143 | .116 | .031 | -.229 |
| | EE5 | -.024 | -.038 | .027 | -.643 | -.002 | .016 |
| | EE6 | .006 | .022 | .017 | .247 | -.149 | .068 |
| | EE7 | -.025 | -.088 | .086 | .046 | -.178 | -.169 |
| | EE8 | .021 | -.180 | .143 | -.074 | -.093 | .231 |
| | EE9 | .211 | -.122 | .066 | .102 | -.210 | -.046 |

a. Measures of Sampling Adequacy(MSA)

**Anti-image Matrices**

| | | EE4 | EE5 | EE6 | EE7 | EE8 | EE9 |
|---|---|---|---|---|---|---|---|
| Anti-image Covariance | mot1 | -.010 | .054 | -.024 | -.014 | .045 | -.041 |
| | mot2 | -.012 | .000 | .019 | -.007 | -.001 | .000 |
| | mot3 | -.006 | -.006 | .016 | -.017 | .016 | -.005 |
| | mot4 | -.009 | -.004 | -.003 | -.007 | .022 | -.001 |
| | mot5 | .012 | .003 | -.003 | .015 | -.031 | .015 |
| | mot6 | .021 | -.042 | -.057 | .004 | .080 | -.054 |
| | mot7 | -.073 | -.007 | .002 | -.008 | .007 | .085 |
| | mot8r | .039 | -.006 | .005 | -.016 | -.035 | -.029 |
| | mot9r | -.028 | .004 | .004 | .014 | .025 | .014 |
| | EE1 | .037 | -.162 | .084 | .012 | -.021 | .036 |
| | EE2 | .008 | .000 | -.040 | -.037 | -.021 | -.057 |
| | EE3 | -.073 | .004 | .023 | -.045 | .066 | -.016 |
| | EE4 | .353 | -.115 | -.002 | -.051 | -.036 | -.017 |
| | EE5 | -.115 | .222 | -.068 | -.007 | .015 | -.007 |
| | EE6 | -.002 | -.068 | .402 | -.081 | -.058 | -.038 |
| | EE7 | -.051 | -.007 | -.081 | .245 | -.108 | .020 |
| | EE8 | -.036 | .015 | -.058 | -.108 | .287 | -.119 |
| | EE9 | -.017 | -.007 | -.038 | .020 | -.119 | .425 |
| Anti-image Correlation | mot1 | -.034 | .239 | -.079 | -.057 | .176 | -.131 |
| | mot2 | -.050 | .001 | .073 | -.033 | -.004 | .000 |
| | mot3 | -.028 | -.038 | .072 | -.098 | .084 | -.021 |
| | mot4 | -.053 | -.027 | -.016 | -.052 | .142 | -.004 |
| | mot5 | .082 | .025 | -.023 | .130 | -.246 | .095 |
| | mot6 | .043 | -.108 | -.109 | .009 | .182 | -.102 |
| | mot7 | -.199 | -.024 | .006 | -.025 | .021 | .211 |
| | mot8r | .183 | -.038 | .022 | -.088 | -.180 | -.122 |
| | mot9r | -.143 | .027 | .017 | .086 | .143 | .066 |
| | EE1 | .116 | -.643 | .247 | .046 | -.074 | .102 |
| | EE2 | .031 | -.002 | -.149 | -.178 | -.093 | -.210 |
| | EE3 | -.229 | .016 | .068 | -.169 | .231 | -.046 |
| | EE4 | .877[a] | -.410 | -.004 | -.174 | -.113 | -.044 |
| | EE5 | -.410 | .828[a] | -.228 | -.031 | .059 | -.022 |
| | EE6 | -.004 | -.228 | .908[a] | -.259 | -.172 | -.091 |
| | EE7 | -.174 | -.031 | -.259 | .901[a] | -.407 | .063 |
| | EE8 | -.113 | .059 | -.172 | -.407 | .834[a] | -.342 |
| | EE9 | -.044 | -.022 | -.091 | .063 | -.342 | .902[a] |

a. Measures of Sampling Adequacy(MSA)

**Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 7.209 | 40.052 | 40.052 | 7.209 | 40.052 | 40.052 |
| 2 | 4.787 | 26.595 | 66.647 | 4.787 | 26.595 | 66.647 |
| 3 | 1.104 | 6.133 | 72.780 | | | |
| 4 | .824 | 4.575 | 77.355 | | | |
| 5 | .741 | 4.119 | 81.474 | | | |
| 6 | .611 | 3.395 | 84.869 | | | |
| 7 | .574 | 3.191 | 88.060 | | | |
| 8 | .397 | 2.206 | 90.266 | | | |
| 9 | .353 | 1.960 | 92.226 | | | |
| 10 | .320 | 1.777 | 94.003 | | | |
| 11 | .263 | 1.461 | 95.464 | | | |
| 12 | .197 | 1.092 | 96.556 | | | |
| 13 | .171 | .950 | 97.506 | | | |
| 14 | .144 | .798 | 98.304 | | | |
| 15 | .117 | .650 | 98.954 | | | |
| 16 | .084 | .467 | 99.421 | | | |
| 17 | .070 | .392 | 99.813 | | | |
| 18 | .034 | .187 | 100.000 | | | |

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

| Component | Rotation Sums of Squared Loadings | | |
|---|---|---|---|
| | Total | % of Variance | Cumulative % |
| 1 | 6.294 | 34.965 | 34.965 |
| 2 | 5.703 | 31.682 | 66.647 |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |

Extraction Method: Principal Component Analysis.

**Rotated Component Matrix**[a]

| | Component | |
|---|---|---|
| | 1 | 2 |
| mot1 | .854 | |
| mot2 | .890 | |
| mot3 | .894 | |
| mot4 | .933 | |
| mot5 | .936 | |
| mot6 | .511 | |
| mot7 | .770 | |
| mot8r | .771 | |
| mot9r | .813 | |
| EE1 | | .664 |
| EE2 | | .896 |
| EE3 | | .784 |
| EE4 | | .804 |
| EE5 | | .792 |
| EE6 | | .755 |
| EE7 | | .872 |
| EE8 | | .795 |
| EE9 | | .722 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

**Time 2**

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .760 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1134.938 |
| | df | 153 |
| | Sig. | .000 |

**Anti-image Matrices**

| | | T2Q1 | T2Q2 | T2Q3 | T2Q4 | T2Q5 | T2Q6 |
|---|---|---|---|---|---|---|---|
| Anti-image Covariance | T2Q1 | .056 | -.054 | -.014 | -.021 | .037 | .006 |
| | T2Q2 | -.054 | .079 | .004 | .015 | -.050 | -.017 |
| | T2Q3 | -.014 | .004 | .087 | -.042 | -.014 | .005 |
| | T2Q4 | -.021 | .015 | -.042 | .071 | -.034 | -.033 |
| | T2Q5 | .037 | -.050 | -.014 | -.034 | .094 | .046 |
| | T2Q6 | .006 | -.017 | .005 | -.033 | .046 | .279 |
| | T2Q7 | -.038 | .041 | -.001 | .016 | -.058 | -.090 |
| | T2Q8r | -.003 | -.017 | .018 | .005 | .005 | -.042 |
| | T2Q9r | .009 | .008 | -.026 | -.006 | .001 | .048 |
| | T2Q46 | -.022 | .020 | -.016 | .029 | -.034 | -.048 |
| | T2Q47 | .002 | -.014 | -.015 | -1.455E-5 | .009 | .015 |
| | T2Q48 | -.025 | .034 | .018 | .004 | -.031 | -.018 |
| | T2Q49 | -.031 | .034 | .001 | .018 | -.004 | .060 |
| | T2Q50 | .034 | -.021 | -.018 | -.005 | .024 | .032 |
| | T2Q51 | -.014 | .019 | .031 | -.015 | -.016 | -.019 |
| | T2Q52 | .028 | -.034 | -.007 | -.008 | .018 | .007 |
| | T2Q53 | -.007 | .012 | .040 | -.015 | -.007 | -.045 |
| | T2Q54 | .020 | -.027 | -.049 | .004 | .045 | .055 |
| Anti-image Correlation | T2Q1 | .738[a] | -.808 | -.202 | -.327 | .503 | .049 |
| | T2Q2 | -.808 | .726[a] | .053 | .200 | -.575 | -.112 |
| | T2Q3 | -.202 | .053 | .866[a] | -.535 | -.158 | .032 |
| | T2Q4 | -.327 | .200 | -.535 | .867[a] | -.408 | -.232 |
| | T2Q5 | .503 | -.575 | -.158 | -.408 | .761[a] | .286 |
| | T2Q6 | .049 | -.112 | .032 | -.232 | .286 | .819[a] |
| | T2Q7 | -.484 | .449 | -.008 | .185 | -.582 | -.521 |
| | T2Q8r | -.031 | -.157 | .156 | .049 | .043 | -.206 |
| | T2Q9r | .107 | .080 | -.260 | -.064 | .005 | .265 |
| | T2Q46 | -.183 | .141 | -.106 | .206 | -.217 | -.176 |
| | T2Q47 | .018 | -.098 | -.105 | .000 | .058 | .055 |
| | T2Q48 | -.290 | .329 | .167 | .036 | -.275 | -.094 |
| | T2Q49 | -.233 | .218 | .004 | .123 | -.023 | .203 |
| | T2Q50 | .281 | -.142 | -.116 | -.039 | .154 | .116 |
| | T2Q51 | -.116 | .132 | .205 | -.108 | -.102 | -.069 |
| | T2Q52 | .308 | -.321 | -.062 | -.078 | .157 | .034 |
| | T2Q53 | -.058 | .084 | .271 | -.109 | -.045 | -.169 |
| | T2Q54 | .174 | -.205 | -.349 | .032 | .309 | .219 |

a. Measures of Sampling Adequacy(MSA)

**Anti-image Matrices**

| | | T2Q7 | T2Q8r | T2Q9r | T2Q46 | T2Q47 | T2Q48 |
|---|---|---|---|---|---|---|---|
| Anti-image Covariance | T2Q1 | -.038 | -.003 | .009 | -.022 | .002 | -.025 |
| | T2Q2 | .041 | -.017 | .008 | .020 | -.014 | .034 |
| | T2Q3 | -.001 | .018 | -.026 | -.016 | -.015 | .018 |
| | T2Q4 | .016 | .005 | -.006 | .029 | -1.455E-5 | .004 |
| | T2Q5 | -.058 | .005 | .001 | -.034 | .009 | -.031 |
| | T2Q6 | -.090 | -.042 | .048 | -.048 | .015 | -.018 |
| | T2Q7 | .107 | .000 | -.019 | .045 | .010 | .030 |
| | T2Q8r | .000 | .150 | -.111 | -.036 | .003 | .002 |
| | T2Q9r | -.019 | -.111 | .116 | .034 | .001 | -.019 |
| | T2Q46 | .045 | -.036 | .034 | .268 | -.063 | .003 |
| | T2Q47 | .010 | .003 | .001 | -.063 | .248 | -.087 |
| | T2Q48 | .030 | .002 | -.019 | .003 | -.087 | .136 |
| | T2Q49 | -.011 | -.032 | .033 | .037 | -.036 | -.035 |
| | T2Q50 | -.052 | .011 | .000 | -.184 | .009 | -.010 |
| | T2Q51 | .009 | .050 | -.042 | .024 | -.023 | .063 |
| | T2Q52 | -.028 | -.002 | .015 | -.027 | .035 | -.093 |
| | T2Q53 | -.007 | .009 | -.020 | .026 | -.117 | .080 |
| | T2Q54 | -.009 | -.045 | .048 | .000 | .051 | -.091 |
| Anti-image Correlation | T2Q1 | -.484 | -.031 | .107 | -.183 | .018 | -.290 |
| | T2Q2 | .449 | -.157 | .080 | .141 | -.098 | .329 |
| | T2Q3 | -.008 | .156 | -.260 | -.106 | -.105 | .167 |
| | T2Q4 | .185 | .049 | -.064 | .206 | .000 | .036 |
| | T2Q5 | -.582 | .043 | .005 | -.217 | .058 | -.275 |
| | T2Q6 | -.521 | -.206 | .265 | -.176 | .055 | -.094 |
| | T2Q7 | .762[a] | .002 | -.171 | .268 | .061 | .247 |
| | T2Q8r | .002 | .763[a] | -.842 | -.178 | .017 | .014 |
| | T2Q9r | -.171 | -.842 | .760[a] | .193 | .007 | -.149 |
| | T2Q46 | .268 | -.178 | .193 | .691[a] | -.244 | .017 |
| | T2Q47 | .061 | .017 | .007 | -.244 | .825[a] | -.474 |
| | T2Q48 | .247 | .014 | -.149 | .017 | -.474 | .662[a] |
| | T2Q49 | -.061 | -.148 | .172 | .127 | -.129 | -.170 |
| | T2Q50 | -.308 | .053 | -.003 | -.688 | .033 | -.054 |
| | T2Q51 | .052 | .247 | -.235 | .089 | -.087 | .329 |
| | T2Q52 | -.226 | -.010 | .118 | -.138 | .187 | -.668 |
| | T2Q53 | -.045 | .048 | -.117 | .100 | -.467 | .434 |
| | T2Q54 | -.056 | -.246 | .297 | .002 | .214 | -.522 |

a. Measures of Sampling Adequacy(MSA)

**Anti-image Matrices**

| | | T2Q49 | T2Q50 | T2Q51 | T2Q52 | T2Q53 | T2Q54 |
|---|---|---|---|---|---|---|---|
| Anti-image Covariance | T2Q1 | -.031 | .034 | -.014 | .028 | -.007 | .020 |
| | T2Q2 | .034 | -.021 | .019 | -.034 | .012 | -.027 |
| | T2Q3 | .001 | -.018 | .031 | -.007 | .040 | -.049 |
| | T2Q4 | .018 | -.005 | -.015 | -.008 | -.015 | .004 |
| | T2Q5 | -.004 | .024 | -.016 | .018 | -.007 | .045 |
| | T2Q6 | .060 | .032 | -.019 | .007 | -.045 | .055 |
| | T2Q7 | -.011 | -.052 | .009 | -.028 | -.007 | -.009 |
| | T2Q8r | -.032 | .011 | .050 | -.002 | .009 | -.045 |
| | T2Q9r | .033 | .000 | -.042 | .015 | -.020 | .048 |
| | T2Q46 | .037 | -.184 | .024 | -.027 | .026 | .000 |
| | T2Q47 | -.036 | .009 | -.023 | .035 | -.117 | .051 |
| | T2Q48 | -.035 | -.010 | .063 | -.093 | .080 | -.091 |
| | T2Q49 | .313 | -.060 | -.031 | -.029 | -.059 | .058 |
| | T2Q50 | -.060 | .266 | -.072 | .031 | .002 | -.003 |
| | T2Q51 | -.031 | -.072 | .271 | -.098 | .035 | -.123 |
| | T2Q52 | -.029 | .031 | -.098 | .144 | -.075 | .056 |
| | T2Q53 | -.059 | .002 | .035 | -.075 | .251 | -.128 |
| | T2Q54 | .058 | -.003 | -.123 | .056 | -.128 | .226 |
| Anti-image Correlation | T2Q1 | -.233 | .281 | -.116 | .308 | -.058 | .174 |
| | T2Q2 | .218 | -.142 | .132 | -.321 | .084 | -.205 |
| | T2Q3 | .004 | -.116 | .205 | -.062 | .271 | -.349 |
| | T2Q4 | .123 | -.039 | -.108 | -.078 | -.109 | .032 |
| | T2Q5 | -.023 | .154 | -.102 | .157 | -.045 | .309 |
| | T2Q6 | .203 | .116 | -.069 | .034 | -.169 | .219 |
| | T2Q7 | -.061 | -.308 | .052 | -.226 | -.045 | -.056 |
| | T2Q8r | -.148 | .053 | .247 | -.010 | .048 | -.246 |
| | T2Q9r | .172 | -.003 | -.235 | .118 | -.117 | .297 |
| | T2Q46 | .127 | -.688 | .089 | -.138 | .100 | .002 |
| | T2Q47 | -.129 | .033 | -.087 | .187 | -.467 | .214 |
| | T2Q48 | -.170 | -.054 | .329 | -.668 | .434 | -.522 |
| | T2Q49 | .871[a] | -.207 | -.106 | -.136 | -.210 | .219 |
| | T2Q50 | -.207 | .724[a] | -.268 | .158 | .006 | -.011 |
| | T2Q51 | -.106 | -.268 | .742[a] | -.494 | .133 | -.495 |
| | T2Q52 | -.136 | .158 | -.494 | .715[a] | -.395 | .310 |
| | T2Q53 | -.210 | .006 | .133 | -.395 | .703[a] | -.537 |
| | T2Q54 | .219 | -.011 | -.495 | .310 | -.537 | .643[a] |

a. Measures of Sampling Adequacy(MSA)

**Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 7.119 | 39.549 | 39.549 | 7.119 | 39.549 | 39.549 |
| 2 | 5.174 | 28.745 | 68.294 | 5.174 | 28.745 | 68.294 |
| 3 | 1.128 | 6.264 | 74.558 | | | |
| 4 | .902 | 5.013 | 79.572 | | | |
| 5 | .715 | 3.974 | 83.546 | | | |
| 6 | .675 | 3.749 | 87.295 | | | |
| 7 | .519 | 2.886 | 90.181 | | | |
| 8 | .368 | 2.042 | 92.223 | | | |
| 9 | .303 | 1.681 | 93.904 | | | |
| 10 | .258 | 1.432 | 95.336 | | | |
| 11 | .221 | 1.228 | 96.564 | | | |
| 12 | .157 | .874 | 97.438 | | | |
| 13 | .138 | .769 | 98.207 | | | |
| 14 | .108 | .598 | 98.804 | | | |
| 15 | .082 | .458 | 99.263 | | | |
| 16 | .063 | .352 | 99.615 | | | |
| 17 | .045 | .251 | 99.866 | | | |
| 18 | .024 | .134 | 100.000 | | | |

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

| Component | Rotation Sums of Squared Loadings | | |
|---|---|---|---|
| | Total | % of Variance | Cumulative % |
| 1 | 6.758 | 37.546 | 37.546 |
| 2 | 5.535 | 30.748 | 68.294 |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | | |
| 15 | | | |
| 16 | | | |
| 17 | | | |
| 18 | | | |

Extraction Method: Principal Component Analysis.

**Rotated Component Matrix[a]**

| | Component | |
|---|---|---|
| | 1 | 2 |
| T2Q1 | .917 | |
| T2Q2 | .872 | |
| T2Q3 | .920 | |
| T2Q4 | .942 | |
| T2Q5 | .907 | |
| T2Q6 | .767 | |
| T2Q7 | .892 | |
| T2Q8r | .738 | |
| T2Q9r | .762 | |
| T2Q46 | | .658 |
| T2Q47 | | .842 |
| T2Q48 | | .856 |
| T2Q49 | | .782 |
| T2Q50 | | .681 |
| T2Q51 | | .785 |
| T2Q52 | | .884 |
| T2Q53 | | .769 |
| T2Q54 | | .735 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

# Appendix F

## Regression Analysis Results for Hypothesis 1

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT delta_BMI
  /METHOD=ENTER delta_avg_Mot.
```

## Regression

**Variables Entered/Removed[b]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | delta_avg_Mot[a] | . | Enter |

a. All requested variables entered.

b. Dependent Variable: delta_BMI

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .376[a] | .141 | .127 | 1.36355 |

a. Predictors: (Constant), delta_avg_Mot

**ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 18.655 | 1 | 18.655 | 10.033 | .002[a] |
| | Residual | 113.416 | 61 | 1.859 | | |
| | Total | 132.071 | 62 | | | |

a. Predictors: (Constant), delta_avg_Mot

b. Dependent Variable: delta_BMI

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -1.480 | .209 | | -7.088 | .000 |
| | delta_avg_Mot | -.724 | .228 | -.376 | -3.168 | .002 |

a. Dependent Variable: delta_BMI

**Regression Analysis Results for Hypothesis 2**

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT delta_avg_EmoExhaust
  /METHOD=ENTER delta_BMI.
```

## Regression

**Variables Entered/Removed[b]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | delta_BMI[a] | . | Enter |

a. All requested variables entered.

b. Dependent Variable: delta_avg_EmoExhaust

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .377[a] | .142 | .128 | .89633 |

a. Predictors: (Constant), delta_BMI

**ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 8.100 | 1 | 8.100 | 10.082 | .002[a] |
| | Residual | 49.008 | 61 | .803 | | |
| | Total | 57.108 | 62 | | | |

a. Predictors: (Constant), delta_BMI

b. Dependent Variable: delta_avg_EmoExhaust

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .552 | .142 | | 3.887 | .000 |
| | delta_BMI | .248 | .078 | .377 | 3.175 | .002 |

a. Dependent Variable: delta_avg_EmoExhaust

**Regression Analysis Results for Hypothesis 3**

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT delta_avg_EmoExhaust
  /METHOD=ENTER delta_avg_Mot.
```

## Regression

**Variables Entered/Removed[b]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | delta_avg_Mot[a] | . | Enter |

a. All requested variables entered.

b. Dependent Variable: delta_avg_EmoExhaust

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .186[a] | .035 | .019 | .95062 |

a. Predictors: (Constant), delta_avg_Mot

**ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 1.984 | 1 | 1.984 | 2.195 | .144[a] |
| | Residual | 55.124 | 61 | .904 | | |
| | Total | 57.108 | 62 | | | |

a. Predictors: (Constant), delta_avg_Mot

b. Dependent Variable: delta_avg_EmoExhaust

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .156 | .146 | | 1.073 | .287 |
| | delta_avg_Mot | -.236 | .159 | -.186 | -1.482 | .144 |

a. Dependent Variable: delta_avg_EmoExhaust

**Regression Analysis Results for Hypothesis 4**

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT delta_avg_EmoExhaust
  /METHOD=ENTER delta_avg_Mot delta_BMI.
```

## Regression

**Variables Entered/Removed[b]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | delta_BMI, delta_avg_Mot[a] | . | Enter |

a. All requested variables entered.

b. Dependent Variable: delta_avg_EmoExhaust

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .380[a] | .144 | .116 | .90254 |

a. Predictors: (Constant), delta_BMI, delta_avg_Mot

**ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 8.234 | 2 | 4.117 | 5.054 | .009[a] |
| | Residual | 48.874 | 60 | .815 | | |
| | Total | 57.108 | 62 | | | |

a. Predictors: (Constant), delta_BMI, delta_avg_Mot

b. Dependent Variable: delta_avg_EmoExhaust

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .504 | .187 | | 2.699 | .009 |
| | delta_avg_Mot | -.066 | .163 | -.052 | -.405 | .687 |
| | delta_BMI | .235 | .085 | .357 | 2.770 | .007 |

a. Dependent Variable: delta_avg_EmoExhaust

**Regression Analysis Results for Hypothesis 5**

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT MEDSMISC
  /METHOD=ENTER EmoExhaust.
```

# Regression

**Variables Entered/Removed[b]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | EmoExhaust[a] | . | Enter |

a. All requested variables entered.

b. Dependent Variable: MEDS-MISC

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .256[a] | .066 | .057 | .350 |

a. Predictors: (Constant), EmoExhaust

**ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | .945 | 1 | .945 | 7.713 | .006[a] |
| | Residual | 13.475 | 110 | .122 | | |
| | Total | 14.420 | 111 | | | |

a. Predictors: (Constant), EmoExhaust

b. Dependent Variable: MEDS-MISC

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -.041 | .077 | | -.532 | .596 |
| | EmoExhaust | .072 | .026 | .256 | 2.777 | .006 |

a. Dependent Variable: MEDS-MISC

### Regression Analysis Results for Hypothesis 6

```
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT delta_Lab_LDL
  /METHOD=ENTER delta_avg_EmoExhaust.
```

## Regression

**Variables Entered/Removed**[b]

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | delta_avg_ EmoExhaust[a] | . | Enter |

a. All requested variables entered.

b. Dependent Variable: delta_Lab_LDL

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .289[a] | .083 | .066 | 18.10153 |

a. Predictors: (Constant), delta_avg_EmoExhaust

**ANOVA**[b]

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 1550.308 | 1 | 1550.308 | 4.731 | .034[a] |
| | Residual | 17038.594 | 52 | 327.665 | | |
| | Total | 18588.901 | 53 | | | |

a. Predictors: (Constant), delta_avg_EmoExhaust

b. Dependent Variable: delta_Lab_LDL

**Coefficients**[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 2.982 | 2.576 | | 1.158 | .252 |
| | delta_avg_EmoExhaust | 5.721 | 2.630 | .289 | 2.175 | .034 |

a. Dependent Variable: delta_Lab_LDL

| REPORT DOCUMENTATION PAGE | *Form Approved* *OMB No. 074-0188* |
|---|---|



| **1. REPORT DATE** *(DD-MM-YYYY)* | **2. REPORT TYPE** | **3. DATES COVERED** *(From – To)* |
|---|---|---|
| 22-03-2012 | Master's Thesis | Oct 2010 – Mar 2012 |

| **4. TITLE AND SUBTITLE** | |
|---|---|
| A Proposed Mediation Model of the Effects of Motivation for a Healthy Lifestyle: Impacts on Emotional Exhaustion, Medication Regimens, and Low-Density Lipoprotein | **5a. CONTRACT NUMBER** |
| | **5b. GRANT NUMBER** |
| | **5c. PROGRAM ELEMENT NUMBER** |
| **6. AUTHOR(S)** | **5d. PROJECT NUMBER** N/A |
| Leuthold, Nathan M., Captain, USAF | **5e. TASK NUMBER** |
| | **5f. WORK UNIT NUMBER** |

| **7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)** | **8. PERFORMING ORGANIZATION REPORT NUMBER** |
|---|---|
| Air Force Institute of Technology<br>Graduate School of Engineering and Management (AFIT/EN)<br>2950 Hobson Way, Building 640<br>WPAFB OH 45433-7765 | AFIT/GEM/ENV/12-M12 |
| **9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)** | **10. SPONSOR/MONITOR'S ACRONYM(S)** |
| Intentionally Left Blank | **11. SPONSOR/MONITOR'S REPORT NUMBER(S)** |

**12. DISTRIBUTION/AVAILABILITY STATEMENT**
Distribution Statement A. Approved for Public Release; Distribution Unlimited

**13. SUPPLEMENTARY NOTES**

**14. ABSTRACT**
This research addressed the question of, "How are behavioral indicators related to physiological responses?" There were three theories (Conservation of Resources; Planned Behavior; and Achievement Motivation) employed to build a proposed model of the effects that an individual's motivation for a healthy lifestyle will have on their emotional exhaustion, daily medication usage, and low-density lipoprotein. Motivation for a healthy lifestyle was hypothesized to have a negative relationship with emotional exhaustion, while utilizing body mass index as a partial mediator. Emotional exhaustion was hypothesized to have positive relationships with daily medication usage and low-density lipoprotein. The model was tested using linear regression modeling and an archival dataset that contained a behavioral survey, anthropometric measurements, and blood samples. All the relationships except those between motivation for a healthy lifestyle and emotional exhaustion, and the partial mediation were supported. An alternate explanation for the lack of support for two of the hypotheses is included. This research is unique, in that it incorporates behavioral constructs and physical outcomes, a combination that has been identified as underutilized in the realms of organizational and behavioral research.

**15. SUBJECT TERMS**
Motivation,, Emotional Exhaustion, Healthy Lifestyle, Low-density Lipoprotein, Conservation of Resources

| **16. SECURITY CLASSIFICATION OF:** | | | **17. LIMITATION OF ABSTRACT** | **18. NUMBER OF PAGES** | **19a. NAME OF RESPONSIBLE PERSON** |
|---|---|---|---|---|---|
| | | | | | Lt Col John J. Elshaw, AFIT/ENV |
| **a. REPORT** | **b. ABSTRACT** | **c. THIS PAGE** | | | **19b. TELEPHONE NUMBER** *(Include area code)* |
| U | U | U | UU | 118 | (937) 255-3636, x4574 |

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18